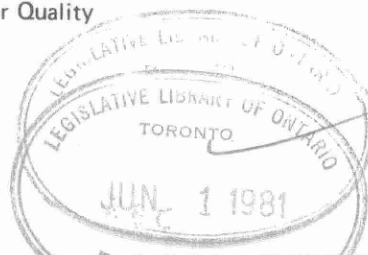


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Reliability of Nitrification Systems with Integrated Phosphorus Precipitation

Research Report No. 64



**Research Program for the Abatement of Municipal Pollution
under Provisions of the Canada-Ontario Agreement
on Great Lakes Water Quality**

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RELIABILITY OF NITRIFICATION SYSTEMS WITH
INTEGRATED PHOSPHORUS PRECIPITATION

by

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RESEARCH PROGRAM FOR THE ABATEMENT
OF MUNICIPAL POLLUTION UNDER THE
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ABSTRACT

The desire to produce high quality effluents from municipal wastewater treatment plants has led to increasingly stringent limitations on the discharge of phosphorus and ammonia-nitrogen. The addition of iron or aluminum salts to a nitrifying activated sludge plant represents an economical method for phosphorus and nitrogen control.

In this study, the effects of metal ion addition on nitrification were assessed by parallel operation of combined and separate sludge carbon removal-nitrification systems with and without chemical addition for phosphorus removal. Paired data analyses indicated little or no effect on filterable total Kjeldahl nitrogen (TKN) removal and nitrate production. Significant increases in alkalinity consumption and sludge production due to addition of Fe^{+3} and Al^{+3} were observed, and the results were compared to theoretical values.

The capacity of nitrifying activated sludge systems to meet effluent variability criteria was determined by parallel operation of combined sludge systems under various flow conditions at temperatures down to 5°C with and without chemical addition for P removal. The solids retention time required to produce a consistently low effluent filterable TKN concentration will be affected by the magnitude and variability of the influent filterable TKN loading under steady or variable flow conditions.

The results indicate that combined sludge systems designed to operate at high solids retention times can produce an effluent filterable TKN concentration of less than 2.5 mg/l 90% of the time at wastewater temperatures as low as 5°C .

RÉSUMÉ

Pour que les stations municipales d'épuration produisent des effluents de plus en plus purs, on a cherché à en réduire radicalement la teneur en phosphore et en azote ammoniacal. Une façon économique de le faire est d'ajouter des sels de fer et d'aluminium aux boues activées nitrifiantes.

Nos travaux ont eu pour objet d'étudier les effets de ces ions métalliques sur la nitrification. Nos expériences ont porté à la fois sur la nitrification et sur l'élimination du carbone dans des systèmes à bassins séparés et dans des appareils combinés, avec et sans addition d'agents chimiques de déphosphation. Une étude comparative des résultats a montré que la production de nitrates et l'élimination de l'azote Kjeldahl total filtrable (NKTF) n'ont guère varié. Nous avons aussi noté que l'addition de Fe^{3+} et d' Al^{3+} avait accru de façon marquée l'alcalinité consommée et la production des boues, et nous avons comparé nos résultats aux valeurs théoriques.

Pour déterminer le rendement de la nitrification des boues activées en regard des critères de variabilité des effluents, nous avons soumis un appareil combiné à diverses conditions de débit et de température (jusqu'à 5°C , limite inférieure) au cours des mêmes expériences, avec ou sans addition d'agent de déphosphatation. Il s'en dégage que la durée de séjour des matières solides, nécessaire au maintien d'un faible taux d'NKTF, variera selon la teneur en ce dernier de l'effluent à traiter, pour un débit soit constant, soit variable.

Les résultats ont montré que, avec les appareils combinés où le séjour se prolonge, la concentration d'NKTF dans l'effluent peut tomber sous $2,5 \text{ mg/l}$, dans 90 p. 100 des cas, même dans des eaux résiduaires à 5°C .

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The desire to produce high quality effluents from municipal wastewater treatment plants has led to increasingly stringent limitations on the discharge of phosphorus and ammonia-nitrogen. The addition of iron or aluminum salts to a nitrifying activated sludge plant could represent an economical method for phosphorus and nitrogen control.

Several activated sludge process alternatives are available for nitrogen transformation and may be classified as either combined or separate sludge carbon removal-nitrification systems. Recent pilot plant studies under constant flow conditions have indicated that equal degrees of nitrification can be achieved in the combined and separate sludge systems, provided the sludge age or solids retention time (SRT) of the systems is maintained at a level to ensure an adequate population of nitrifiers (Sutton et al, 1975; Lawrence and Brown, 1976). In the design of a system for both nitrogen and phosphorus control, an important consideration in the selection of a combined or separate sludge system is the compatibility of the chemical precipitant and the required microbial population. Although several investigators have studied phosphorus removal by precipitation with metal salts, little attention has been paid to the effects on nitrification.

The optimum pH condition for phosphorus removal by aluminum and iron is normally reported around 5 to 6. Since the optimum range for carbonaceous oxidation is approximately pH 6 to 8, the two treatment goals of carbon and phosphorus removal can be met simultaneously. As the optimum pH condition for nitrification is around 8 to 9 (Wild et al, 1971), and carbon removal-nitrification and phosphorus removal are to be accomplished simultaneously, a compromise in establishing an operating pH must be reached.

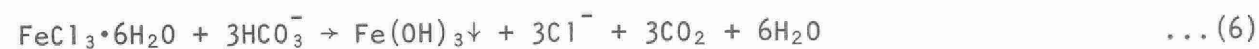
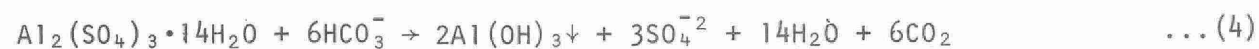
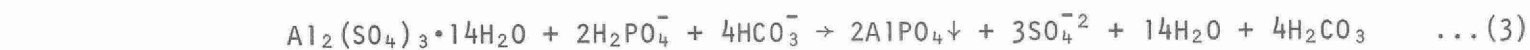
Nitrification is a hydrogen ion producing reaction. Assuming the pH is less than 8.5, the hydrogen ions produced react with the bicarbonate in the wastewater, resulting in an increase in CO_2 concentration and a decrease in bicarbonate alkalinity (Table 1). The additional alkalinity demand imposed by the addition of alum or ferric chloride (Table 1) may result in a significant pH reduction unless

TABLE 1. EFFECTS OF NITRIFICATION AND CHEMICAL ADDITION ON REACTOR ALKALINITY

BIOLOGICAL OXIDATION AND NEUTRALIZATION



PHOSPHORUS PRECIPITATION AND HYDROLYSIS



there is adequate buffering capacity in the wastewater. In a low alkaline wastewater, the use of sodium aluminate as the precipitating chemical, which upon reacting with phosphate ions increases alkalinity, may be justified.

The results from the operation of a 132 m³/day (20 gpm) extended aeration pilot plant with alum or ferric chloride addition indicated that nitrification could still be maintained (Sutton et al, 1975) even with a moderate wastewater alkalinity (150 mg/l as CaCO₃) and the resulting reactor pH was less than 7. Similarly, Hais et al (1971) reported that substantial nitrification occurred in a step feed activated sludge system with alum addition even though the pH in the final stage was less than 7.

Black (1971) reported successful operation of a carbon removal-nitrification extended aeration system when alum or ferric chloride was added for phosphorus removal. The experimental program was not designed to study the effects of chemical addition on nitrification, and, therefore, the results were based on a very limited amount of data.

Contrary to these reports, Long et al (1971), operating a portion of the Pennsylvania State University biological wastewater treatment plant, reported a decrease in nitrification when alum was used as the precipitating chemical. The lower degree of nitrification corresponded to a reduction in pH, which occurred as a result of addition of alum into the effluent end of the aeration tank. When alum was added at the head end of the tank, no reduction in pH or nitrification was reported, but since the solids retention time (SRT) during this period was much higher, the authors were unable to draw any definite conclusions.

Unz and Davis (1975) found municipal wastewater sludges treated with alum contained fewer nitrite-oxidizing bacteria than untreated sludges. This result could not be conclusively related to aluminum ion toxicity. The sludges had undergone a sharp reduction in pH and had SRT's of less than two days, conditions not conducive to the build-up of nitrifiers. No significant difference was observed between ammonia-oxidizing populations in alum treated and untreated sludges.

In view of the conflicting reports, it was considered that additional kinetic and operational data were required to define specifically the effects of chemical addition on nitrifying systems.

Traditionally, wastewater treatment plant design has been based on the assumption of steady-state and the expected performance weighted according to the mean or composite results. Significant diurnal variations in influent flow and organic and inorganic concentrations, together with the inherent variability of the treatment process, will affect the effluent quality unless considered during initial design.

The influent wastewater characteristics normally vary on a daily, as well as an hourly, basis. Daily influent fluctuations may result in daily effluent variability. Average performance predictions are not adequate to assess the capacity of a proposed design to meet effluent variability criteria. The reported sensitivity of the nitrifying organisms further justifies the need to examine the variability of biological systems designed for concurrent nitrification and phosphorus precipitation.

In the past, consideration has been given to the development of models to describe the time dependent behaviour of biological processes. The methods and models proposed for the activated sludge process have tended to be too complicated to be useful to the design engineer. Recently, a simplified, but realistic attempt to handle variable loading conditions using frequency analysis techniques has been proposed by Novotny (1976).

Attempts at quantifying the effects of variable inputs are further complicated when nitrification and the removal of both phosphorus and carbon are the treatment goals. Some consideration has been given to the effects of input variations on the performance of combined and separate sludge nitrifying systems (Poduska and Andrews, 1975; Murphy et al, 1976; U.S. EPA, 1975). These studies involved the use of numerical solution techniques to handle transient load effects, but did not consider the effects of integrated phosphorus removal.

This study examined at the pilot scale level the effects of chemical additions on combined and separate sludge nitrifying systems.

In addition, the hourly and daily effluent variability from nitrifying activated sludge systems were assessed and methods explored to allow systems to be designed to meet effluent variability criteria.

2 EQUIPMENT AND PROCEDURES

2.1 Pilot Plant Design and Operation

One phase of an extensive nitrification-denitrification pilot plant program, being conducted at the Wastewater Technology Centre, Canada Centre for Inland Waters, Burlington, involves the parallel operation of carbon removal-nitrification activated sludge systems ranging in size from 8.2 to 132 m³/day (1.25 to 20 gpm).

The carbon removal-nitrification systems employed to evaluate concurrent phosphorus and nitrogen control included a two-stage separate (TSS) sludge system and a two-stage combined (TSC) sludge system (Figure 1). The reactors, designated as plants A and B, consisted of two, 2.18 m³ (480 gal) acrylic plastic, dispersed air aeration tanks. Plant A contained a removable divider separating the reactor into two aeration tanks in series. Plant B contained a fixed divider separating the reactor into two aeration tanks, thereby allowing operation of the TSC system or the TSS system. The flow scheme during operation of the separate sludge system involved intermediate clarification (Figure 1) between the carbon removal and nitrification stages. The circular clarifiers were 0.76 m (2.5 ft) in diameter providing a surface settling rate of 8 m³/day/m² (368 gpd/ft²) and a hydraulic detention time of 1.6 hr at a feed rate of 4.68 l/min (1.25 gpm).

The use of dye studies to approximate the hydraulics of the systems indicated that the two aeration tanks of plant B, when operated as a separate sludge system (TSS), could be considered completely mixed. The mixing regime in the two-stage combined sludge system (TSC) could be approximated by a value of D/UL equal to 0.2, closer to conditions characteristic of full scale basins with large length to width ratios. Variable speed positive displacement pumps, in conjunction with a magnetic flow metering transmitter and cam cycle controller recorder delivered the degrittied municipal wastewater to the reactors in any desired hydraulic pattern from a temperature control unit capable of cooling to 3°C or heating to 25°C. The wastewater was pumped to the temperature controller from the Burlington Skyway Sewage Treatment Plant, and contained normal diurnal variations in organic and inorganic concentrations (Table 2).

Alum (Al₂(SO₄)₃•14H₂O) or ferric chloride (FeCl₃•6H₂O) was added to the separate and combined sludge systems, in accordance with the experimental design, at concentrations to maintain an Al⁺₃ or Fe⁺₃ to total influent

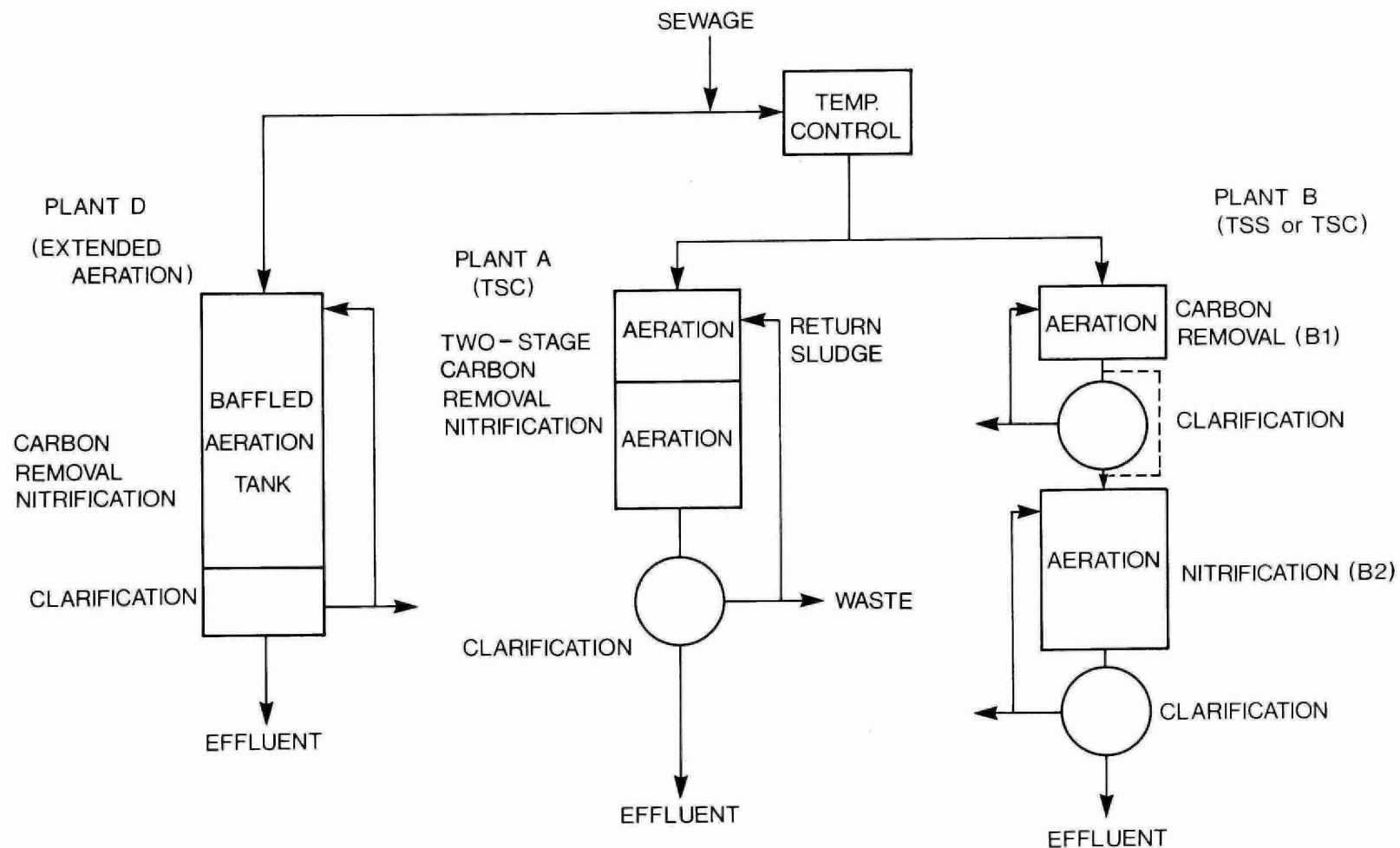


FIGURE 1. FLOW DIAGRAM OF CARBON REMOVAL-NITRIFICATION PILOT PLANT SYSTEMS

P ratio between 1.0 and 2.0. Depending on the experiment in progress, the chemical addition point was the suction side of the return sludge pumps or the effluent end of the aeration tank (Appendix B) during operation of the combined sludge system. Chemical addition was to the suction side of the first stage (B1, Figure 1) return sludge pump during operation of the separate sludge system.

TABLE 2. RAW WASTEWATER CHARACTERISTICS

Characteristic mg/l	Mean	90%*
COD	220	315
BOD ₅	98	138
SS	135	300
Total P	5	10
Filterable NH ₄ -N	12	19
Filterable TKN	15	21
Alkalinity (as CaCO ₃)	231	269

* 90% of observations are equal to or less than stated value.

In order to determine the kinetic removal rates used to describe the performance of the activated sludge systems with and without chemical addition, the effluent from the reactors must contain residual filterable ammonium nitrogen. When complete nitrification was expected, the wastewater was supplemented with inorganic nitrogen (NH₄Cl). Bicarbonate (NaHCO₃) was added to the feed when necessary to avoid any alkalinity limitation on the nitrification rate. The dissolved oxygen in the reactors was maintained at or above 2.0 mg/l.

To assess the effluent variability of nitrifying activated sludge systems, the 132 m³/day pilot plant (plant D) was operated in parallel with the two 8.2 m³/day pilot plants under ambient conditions. Plant D (Figure 1) was an extended aeration activated sludge system consisting of a 132 m³ liquid volume baffled aeration tank reactor and an attached upflow clarifier.

The performance of the nitrification systems was assessed using 24-hr flow-weighted sampling under temperature and system solids

retention time (SSRT) conditions specified by the experimental design. The SSRT, defined as the suspended solids under aeration divided by the daily solids lost in the effluent or through sludge wasting, was controlled automatically by wasting from the return sludge lines. Details concerning the calculation of the SSRT for the combined and separate sludge systems appear in Appendix A.

2.2 Experimental Design

The two-stage combined and separate sludge systems (TSC, TSS) were operated with chemical addition for phosphorus removal to define the effects on nitrifying biological systems. A complete factorial design was carried out involving the two sludge systems, two choices of chemical precipitant, and two levels of temperature (Table 3). The chemicals selected, alum and ferric chloride, are those most commonly used for integrated phosphorus removal in a biological system. The temperature levels 5°C and 25°C reflect the range over which treatment plants may operate in continental climates. A parallel two-stage combined sludge system without chemical addition (TSC) was operated under identical temperature and biological SSRT conditions throughout the experimental period. The SSRT conditions were maintained between 8 and 10 days in each of the parallel systems.

In operating biological systems, especially with chemical addition, it is most important that equilibrium conditions are attained prior to the investigative period. This factor, together with a limited experimental time period, made a purely statistical randomization of experiments unrealistic. The completed experimental design (Table 4) resulted in a balanced set of paired data allowing determination of the effects of chemical addition on separate (TSS) and combined (TSC) sludge systems.

The variability of combined sludge carbon removal-nitrification systems was determined by operating parallel systems under various flow conditions with and without chemical addition (FeCl_3) for phosphorus removal (Table 5). Realizing the severe temperature sensitivity of the nitrification process, the reactors were operated at temperatures down to 5°C and at or above critical (10-day) SRT conditions (Sutton, 1976)

for pseudo "steady-state" operation (constant flow and normal diurnal variations in organic and inorganic concentrations) to establish an upper level of process variability. The performance of the systems during each variability experiment was assessed over a 16 consecutive day period once both chemical and biological equilibrium was established.

TABLE 3. EXPERIMENTAL DESIGN LEVELS FOR PHOSPHORUS REMOVAL-NITRIFICATION STUDY

Qualitative or Quantitative Variable	Treatment Type or Variable Level	Design Level
Sludge System	Combined (TSC)	+
	Separate (TSS)	-
Chemical Additive	Alum	+
	Ferric Chloride	-
Temperature (°C)	25	+
	5-7	-

Note: TSC means two-stage combined.

TSS means two-stage separate.

TSC* system without chemical addition operating in parallel during each experiment at the design temperature level.

2.3 Sample Preparation and Analyses

Samples for organic carbon were prepared by filtration through 0.3 micron Gelman glass fibre filters followed by acidification to pH 2 with concentrated hydrochloric acid. Unfiltered TKN and COD samples were acidified with concentrated sulphuric acid. NO_3^- -N, NO_2^- -N, filtered TKN, NH_4^+ -N and COD were prepared for analyses by filtration through 0.3 micron Gelman glass fibre filters and frozen, together with BOD samples, while awaiting analyses.

The analytical procedures used are detailed in Appendix A.

TABLE 4. EXPERIMENTAL DESIGN FOR SYSTEM COMPARISON

Run No.	Qualitative and Quantitative Variable Levels		
	Sludge System	Chemical Additive	Temperature
PSS-1, 2	+	-	+
PSS-3, 4	-	-	+
PSS-5, 6	-	-	-
PSS-7, 8	+	-	-
PSS-9, 10	+	+	+
PSS-11, 12	-	+	+
PSS-13, 14	-	+	-
PSS-16, 17	+	+	-
Repeats			
PSS-15	+	*	-
PSS-18	-	-	+

Note: TSC* system without chemical addition operating in parallel during each experiment at the design temperature level.

* No chemical addition.

TABLE 5. EXPERIMENTAL DESIGN FOR EFFLUENT VARIABILITY STUDY

Run No.	Parallel Systems	Flow Conditions		Temp. °C	SRT days	Chemical Addition
		Rate m ³ /day	Variation			
V-1	TSC	8.2	None	5	15	None
	TSC	8.2	None	5	10	None
	*FSC	132	None	7-9	10	None
V-2	TSC	8.2	Sinusoidal	5	10	None
	TSC	8.2	Sinusoidal	5	10	FeCl ₃

Note: * Five-stage combined sludge system (FSC) operated at ambient temperature conditions.

3 DISCUSSION OF RESULTS

3.1 Effects of Chemical Addition on Nitrification

Appendix B contains a computer listing of the complete day-to-day operating and analytical results during the pilot plant program. A summary of the results of experiments designed to assess the effects of chemical addition on the carbon removal-nitrification systems (Table 4) together with repeated experiments is included in Appendix A (Table A1).

The parallel 8.2 m³/day pilot plants were seeded by the addition of return sludge from the 132 m³/day extended aeration plant, which was at an SRT of approximately 10 to 15 days. The extended aeration plant had originally been seeded with return sludge from the Burlington Skyway Sewage Treatment Plant.

The approach to chemical equilibrium began with the addition of ferric chloride to plant B operating as a TSC sludge system in accordance with the experimental design (Table 4, Run PSS-1).

In all experiments, the fraction of the theoretical chemical equilibrium achieved (Figure 2) was generally in excess of 90% (Table A1), the operating period having normally exceeded two times the system solids residence time. The biological equilibrium in both parallel systems (plants A and B), was always in excess of the chemical equilibrium as the SSRT's were maintained between 8 and 10 days throughout the experimental program.

The carbon removal-nitrification systems were compared first in terms of the effect of ferric chloride or alum addition on the removal of filterable TKN. The paired data indicated comparable removal of filterable TKN by the combined sludge system without chemical addition at an equal SSRT and temperature (Figure 3). When the paired data were examined statistically, the resulting "t" values were less than the critical value (95% level), indicating no difference in filterable effluent TKN concentration (Table 6).

The insignificant effect of chemical addition is verified by comparable nitrate production (Figure 3). This observation is supported also by the "t" tests (Table 6).

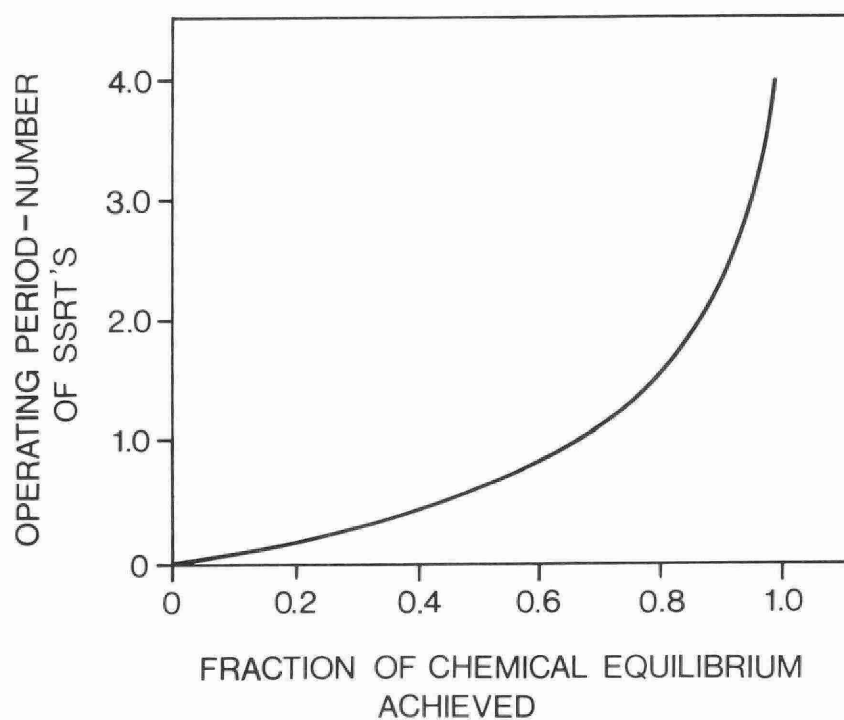


FIGURE 2. THEORETICAL RELATIONSHIP BETWEEN CHEMICAL EQUILIBRIUM AND PERIOD OF OPERATION

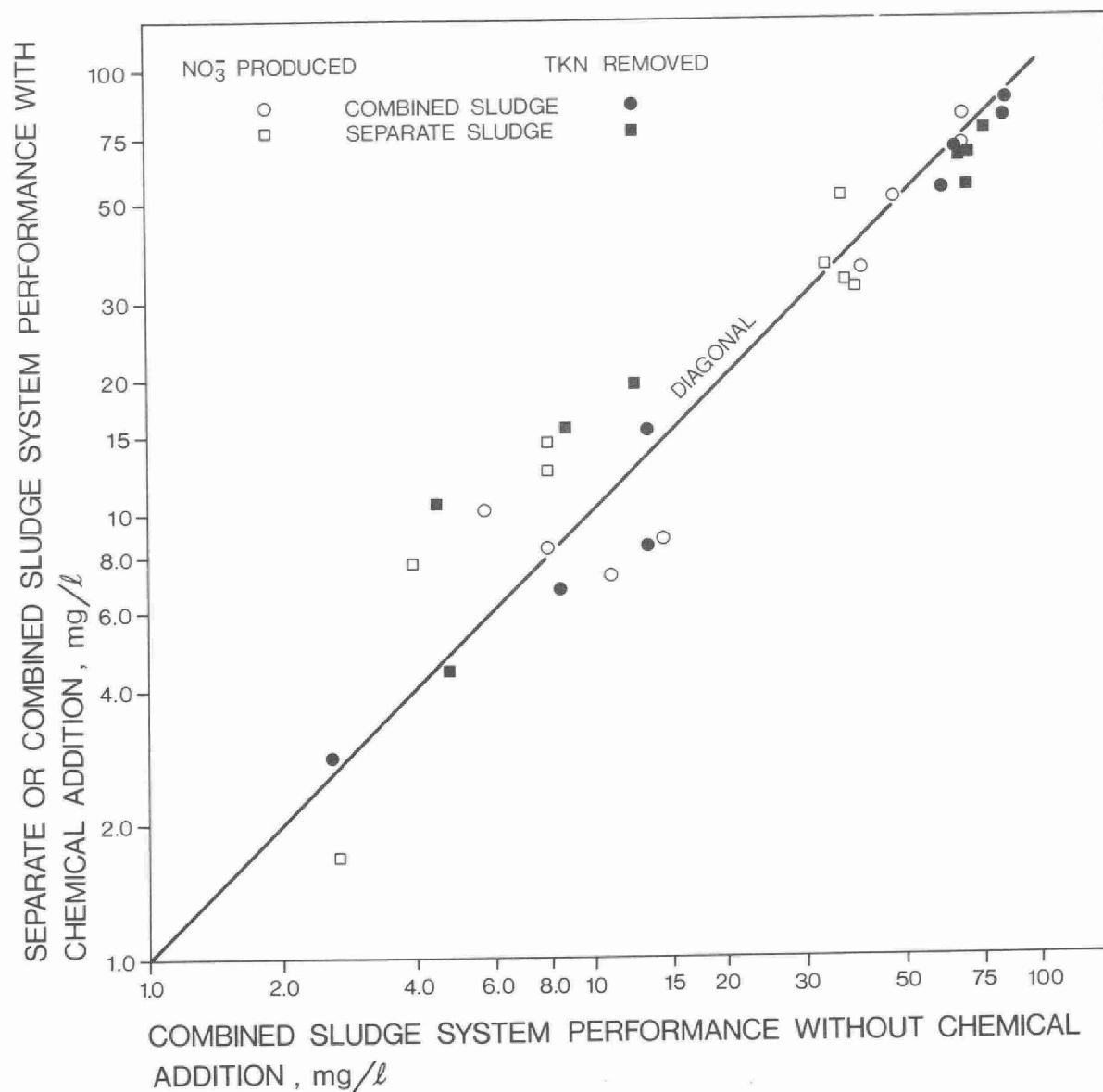


FIGURE 3. PAIRED DATA COMPARISON OF NITRIFICATION PERFORMANCE WITH AND WITHOUT CHEMICAL ADDITION

TABLE 6. DIFFERENCE IN EFFLUENT RESULTS FROM PARALLEL OPERATING SYSTEMS WITH AND WITHOUT CHEMICAL ADDITION

Parameter mg/l	$\bar{D}$	S_D^2/n	t	$t_{\alpha = .95}$
<u>TSC vs TSC*</u>				
Filterable TKN	3.29	2.71	2.00	2.31
NO ₃ ⁻ -N	-0.09	2.71	0.06	2.31
Total Filterable P	-1.57	0.05	7.27	1.90
<u>TSS vs TSC*</u>				
Filterable TKN	2.40	9.12	0.80	2.31
NO ₃ ⁻ -N	-2.24	5.92	0.92	2.31
Total Filterable P	-1.95	0.08	6.72	1.86

Note: * means without alum or ferric chloride addition,

$$\frac{S_D^2}{n} = \text{estimated variance of } \bar{D}, \text{ where}$$

$$S_D^2 = \frac{\sum (D_i - \bar{D})^2}{n-1},$$

D_i = difference in effluent parameter value
(with chemical addition - without chemical addition)

$\bar{D}$ = mean difference

n = number of paired data points, and

$$t = \frac{\bar{D}}{S_D / (n)^{1/2}}$$

The paired data from the operation of the combined sludge system without chemical addition (TSC*) in parallel with either the TSC or TSS sludge system with chemical addition allowed a straight forward statistical assessment. In comparing the two systems with chemical addition (TSC and TSS), such a procedure was not possible. The mean differences in effluent filterable TKN between both the TSC and TSS systems with chemical addition and the TSC* system, were determined. The two mean values were examined statistically to

determine if they were significantly different from each other. Normal statistical procedures assume the populations from which the two means were derived have equal variances. In this instance, the ratio of the variances when compared to the "F" statistic, indicated that such an assumption was warranted (Table 7), and allowed the use of a "t" test for the comparison of the means. The resulting "t" value was not significant, implying that equal filterable TKN removal was obtained with both combined (TSC) and separate (TSS) sludge systems receiving chemical addition for phosphorus removal. A similar data analysis indicated that both sludge systems (TSC and TSS) produced equal amounts of nitrate (Table 7).

The combined and separate sludge systems receiving chemical addition should remove a significantly greater amount of filterable phosphorus when compared to the system without chemical addition. Analyses of the paired data confirm this expectation (Table 6). Analyzing all the results from experiments designed to assess the effects of chemical addition on the carbon removal-nitrification systems (Table B1), the geometric mean values of effluent total filterable P are 0.35 and 2.1 mg/l from systems with and without chemical addition (Figure 4), respectively.

In selecting a combined or separate sludge system for carbon removal-nitrification with integrated phosphorus precipitation, the comparative degree of phosphorus reduction in the systems is an important consideration. An assessment of the effect of the process configuration on phosphorus reduction can be determined by examining the differences in mean total filterable P removed in the systems with (TSC and TSS) and without (TSC*) chemical addition. The result of this analysis (Table 7) implies equivalent filterable P removal in the combined and separate sludge systems receiving chemical addition.

3.2 Alkalinity Demand

The alkalinity demand imposed by the processes of biological nitrification, and phosphorus precipitation and hydroxide formation, is an important consideration in designing an activated sludge system with integrated phosphorus removal. In the current pilot plant program

TABLE 7. DIFFERENCE IN EFFLUENT RESULTS FROM COMBINED AND SEPARATE SLUDGE SYSTEMS WITH CHEMICAL ADDITION

Parameter	System Compared to TSC*	$\bar{D}$	S_D^2	$\frac{S_{D1}^2}{S_{D2}^2}$	F $\alpha = .95$	t	t $\alpha = .95$
Filterable TKN	TSC	3.29	21.72	3.36	4.99	0.26	2.15
	TSS	2.40	72.93				
NO ₃ ⁻ -N	TSC	-0.09	21.72	2.18	4.99	0.80	2.15
	TSS	-2.24	47.37				
Total Filterable P	TSC	-1.57	0.38	1.76	4.90	1.01	2.16
	TSS	-1.95	0.67				

Note: $S_D^2 = \frac{\sum (D_i - \bar{D})^2}{n-1}$

n = number of paired data points

$t = \frac{\bar{D}_{TSC} - \bar{D}_{TSS}}{S_p \left(\frac{1}{n_{TSC}} + \frac{1}{n_{TSS}} \right)^{1/2}}$ where,

S_p^2 = pooled variance for D_{TSC} - D_{TSS} , and

$S_p^2 = \frac{n_{TSC} (S_{D TSC}^2) + n_{TSS} (S_{D TSS}^2)}{n_{TSC} + n_{TSS}}$

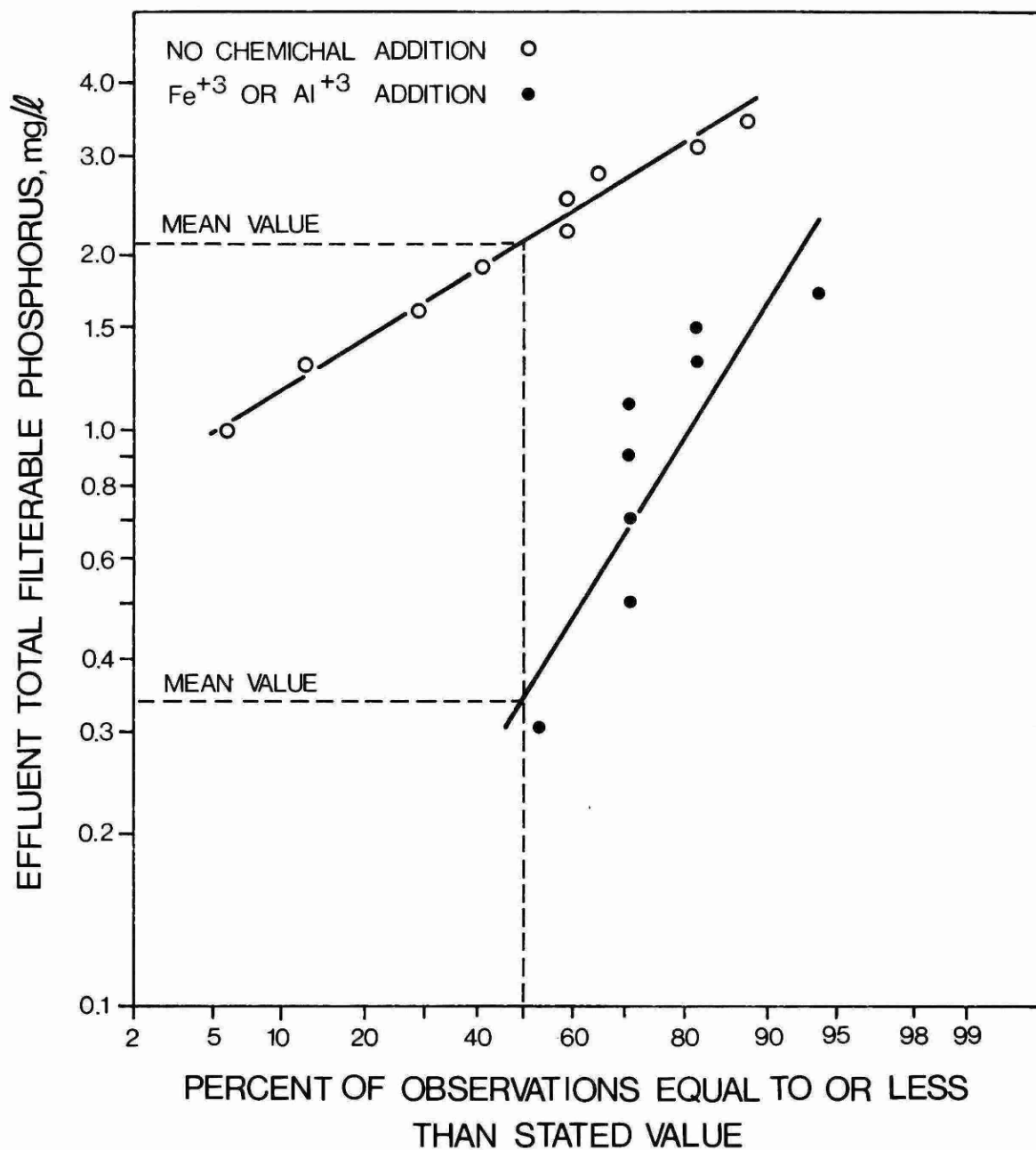


FIGURE 4. PHOSPHORUS REMOVAL IN COMBINED AND SEPARATE SLUDGE SYSTEMS

bicarbonate was added to the feed when necessary to avoid an alkalinity limitation. The observed geometric and arithmetic mean values for the alkalinity consumed in the system without chemical addition were, respectively, 6.0 and 6.2 grams of alkalinity (as CaCO_3) per gram of filterable TKN removed (Figure 5). The theoretical alkalinity consumption ratio for nitrification is 7.2 (Table 1) assuming the decrease in filterable TKN is proportional to the decrease in NH_4^+-N . The geometric and arithmetic mean consumption ratios for the systems receiving chemical addition were, respectively, 8.0 and 8.1 (Figure 5).

Parallel operation of the systems with and without chemical addition for phosphorus removal allowed the observed increase in alkalinity consumption to be compared with the calculated theoretical increase. As the paired data analysis indicated that equal filterable TKN removal could be expected from combined and separate sludge systems with and without chemical addition (Table 6), the observed increase in alkalinity consumption can be directly attributed to the processes of phosphorus precipitation and hydroxide formation. The stoichiometric alkalinity and chemical requirements for precipitation can be calculated from equation 3 or 5 (Table 1) by considering the difference in filterable total phosphorus removal between the parallel systems to represent the phosphorus removed by precipitation. The quantity of metal ion remaining for hydroxide formation can then be determined by knowing the quantity added, and thus the additional alkalinity consumption can be calculated from equation 4 or 6 (Table 1). This final calculation assumes that all the alum or ferric chloride added is consumed for precipitation and hydroxide formation. The observed influent and effluent results indicate no increase in Al^{+3} or Fe^{+3} verifying this assumption (Figures 6 and 7).

The validity of determining the increase in alkalinity consumption by use of the stoichiometric equations was assessed by comparing the observed and calculated values during the parallel operation of combined sludge systems with and without Fe^{+3} addition for a 16 consecutive day period (Table 5). The mean value for the

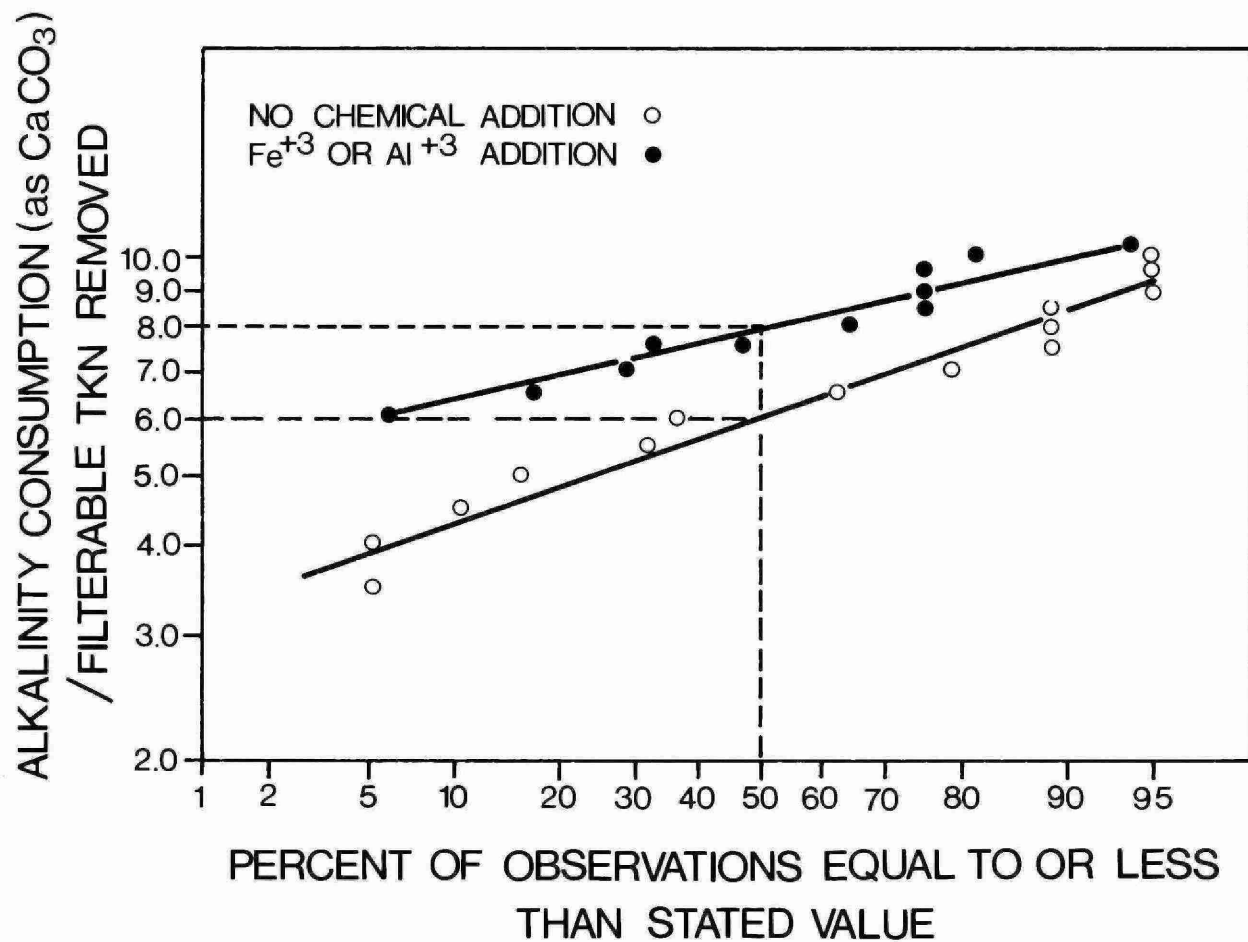


FIGURE 5. ALKALINITY CONSUMPTION IN NITRIFICATION SYSTEMS WITH AND WITHOUT CHEMICAL ADDITION

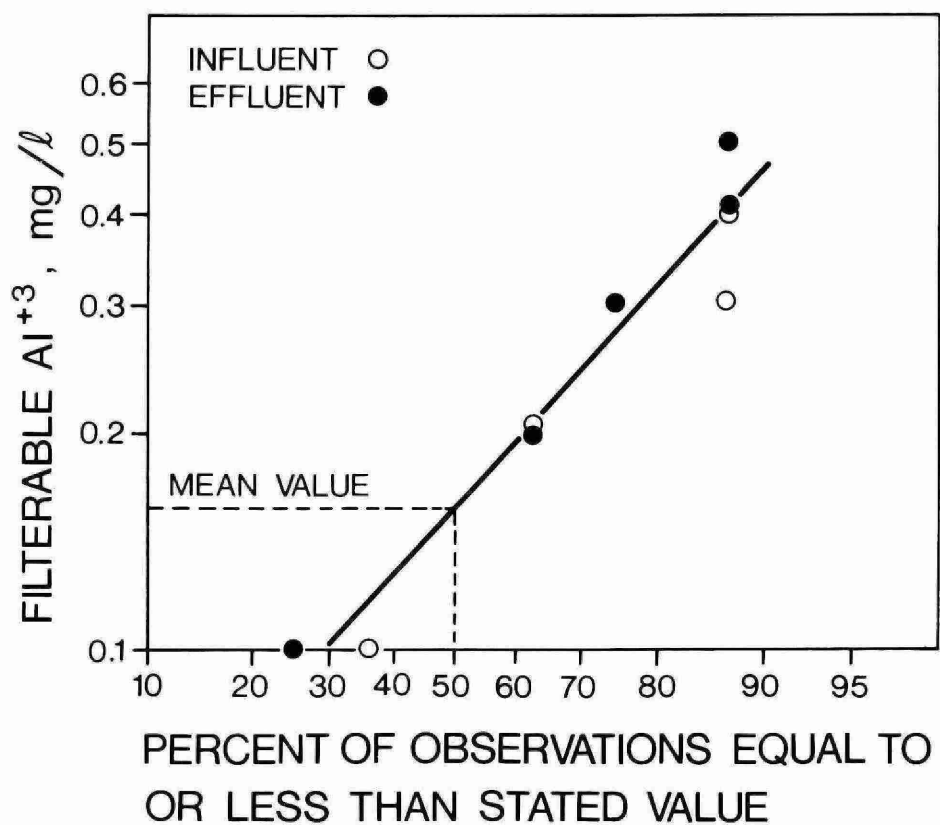


FIGURE 6. OBSERVED INFLUENT AND EFFLUENT ALUMINUM RESULTS

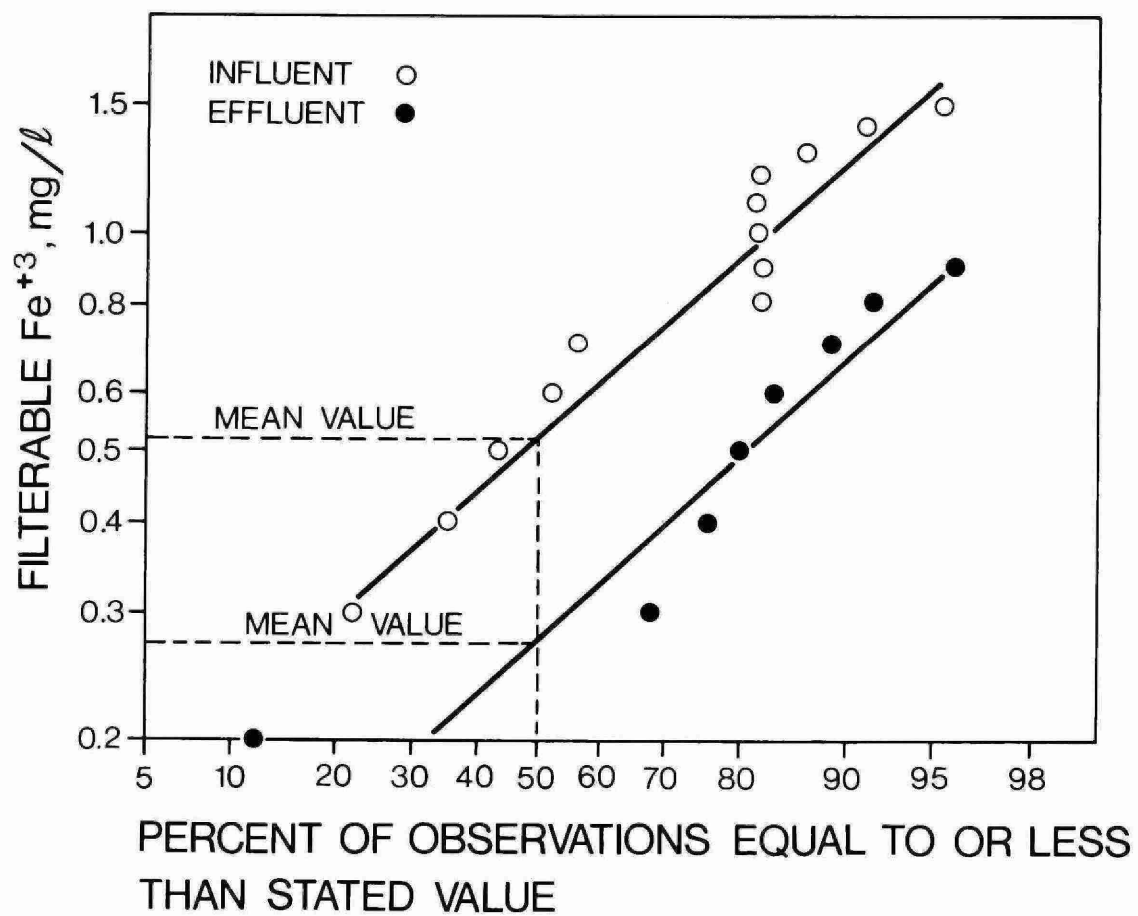


FIGURE 7. OBSERVED INFLUENT AND EFFLUENT FERRIC IRON RESULTS

ratio of observed to theoretical alkalinity consumption was 1.10 (Figure 8). Details of the calculations involved in determining the theoretical alkalinity consumption are included in Appendix A.

3.3 Sludge Production and Characteristics

Integrated phosphorus precipitation in a biological system results in an increase in sludge production caused by precipitation (equations 3 and 5) and hydroxide formation (equations 4 and 6). By determining the cumulative solids wasted during a pseudo "steady-state" operating period (Appendix B) either in the process effluent or by intentional daily wasting, solids production from the parallel operating alternatives was compared (Figure 9).

The evident increase in sludge production during operation of the separate sludge system (TSS) with chemical addition in parallel with the combined sludge system without chemical addition (TSC*), is caused by both the effects of chemical addition and reactor configuration. The low SRT of the first stage reactor (reactor B1, Figure 1) of the separate sludge system, results in a significantly greater amount of biological solids production in this system when compared to the combined sludge system (Stall and Sherwood, 1974; Lawrence and Brown, 1976). Sutton et al (1975), in operating parallel combined and separate nitrifying activated sludge systems, determined that for each kg of sludge produced in the combined sludge system, 1.6 kg of sludge was produced from the separate sludge system. This value was used in order to calculate the increase in sludge production due to chemical addition alone when the systems were compared in this study.

Assessment of the paired data indicated an additional 1.23 kg of solids were produced in the separate or combined sludge system receiving Al^{+3} or Fe^{+3} addition for each kg of solids produced in the parallel (TSC*) system (Figure 10).

The U.S. Environmental Protection Agency (1976) recommends, based on a limited amount of information, that when using alum or ferric chloride addition for integral P removal in the activated sludge process, the sludge production due to the chemical addition be

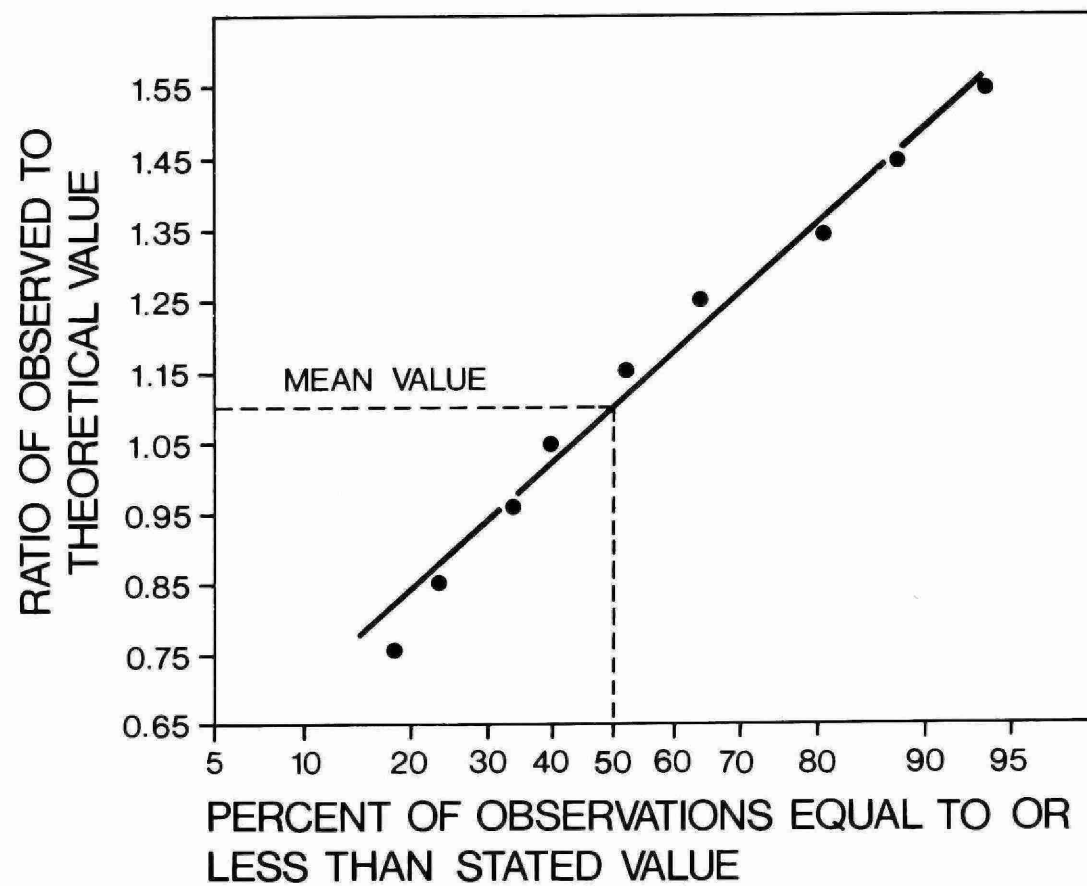


FIGURE 8. ALKALINITY CONSUMPTION DUE TO FERRIC IRON ADDITION

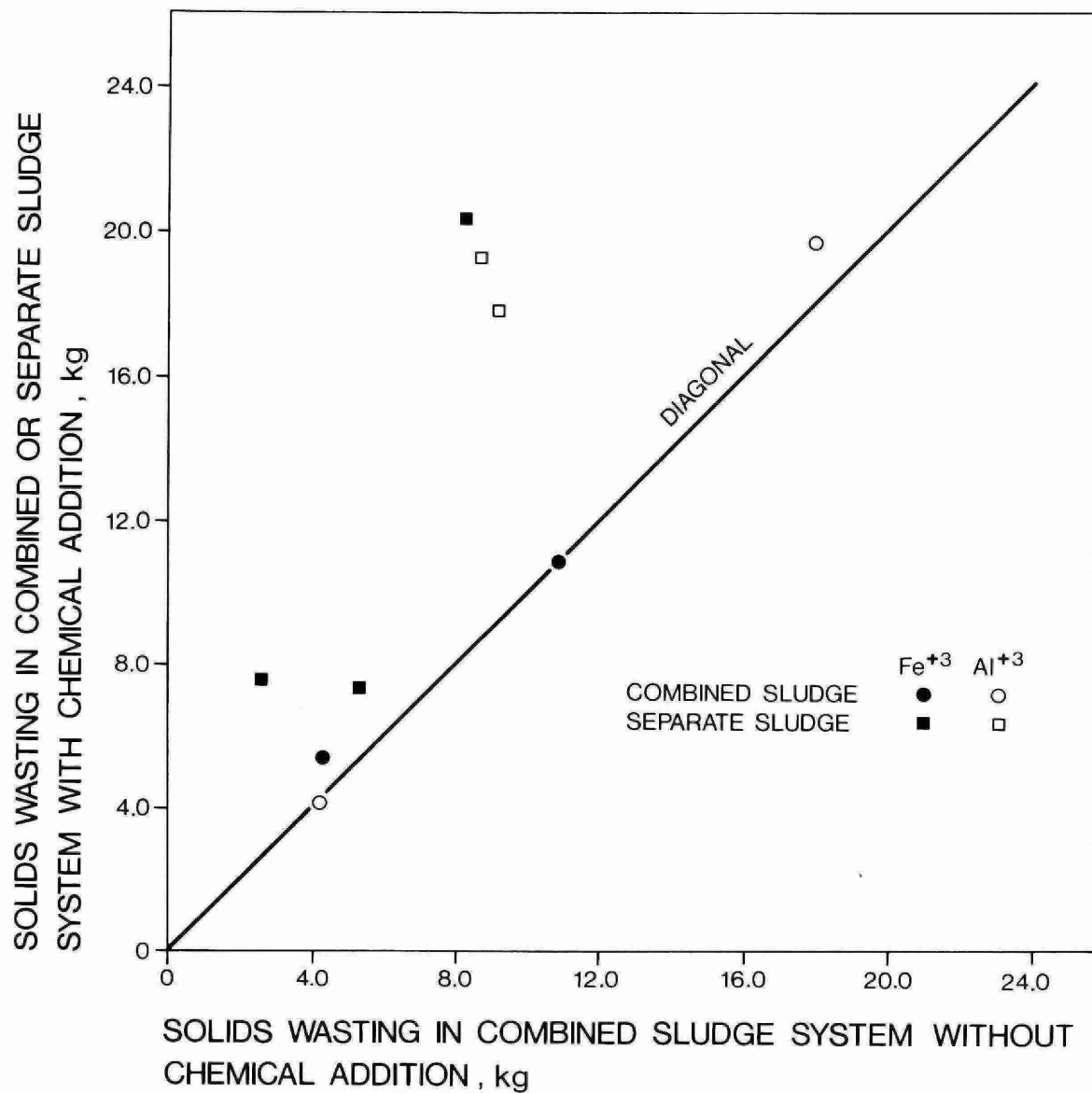


FIGURE 9. REQUIRED SOLIDS WASTING IN SYSTEMS WITH AND WITHOUT CHEMICAL ADDITION

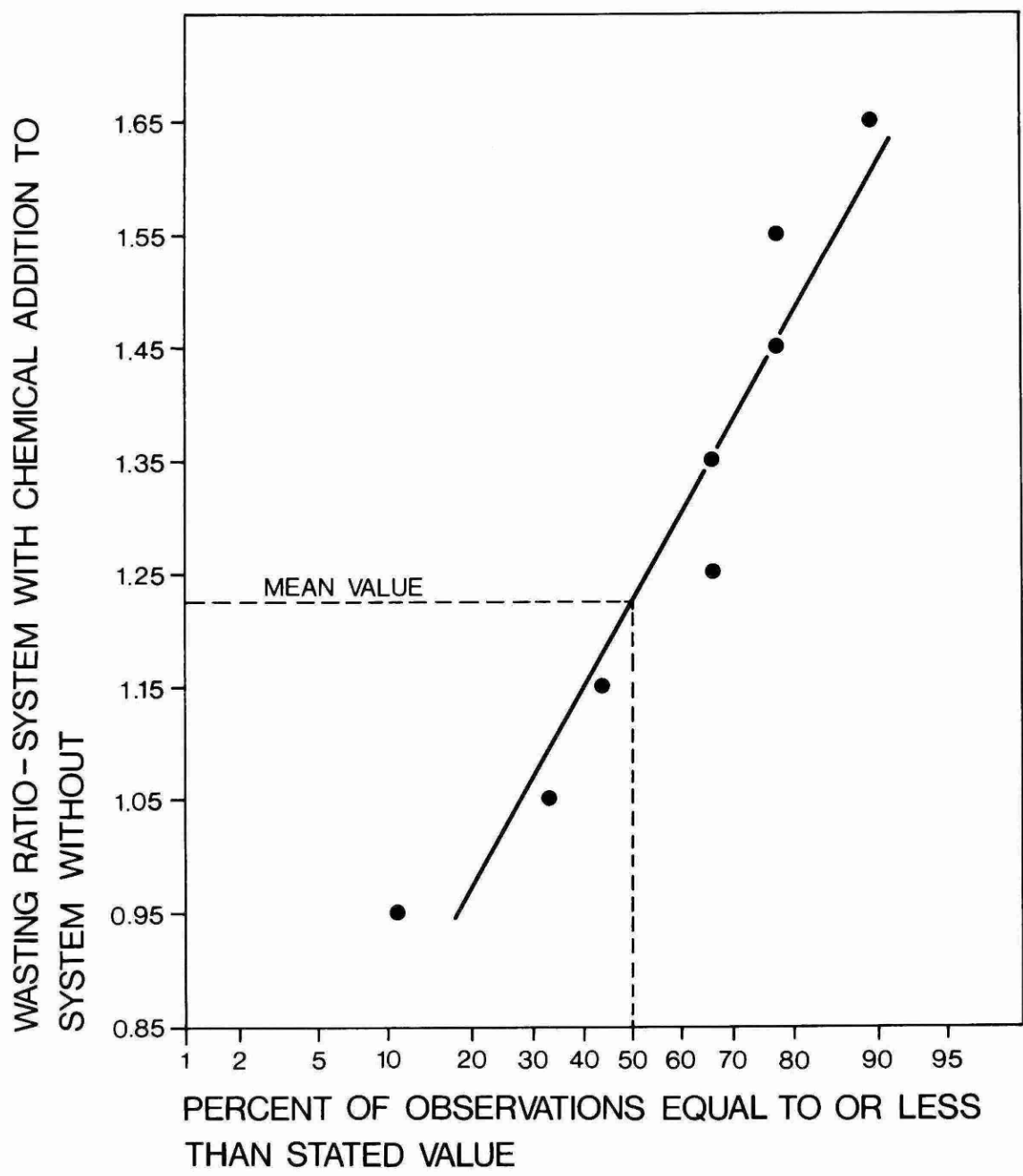


FIGURE 10. INCREASE IN REQUIRED SOLIDS WASTING DUE TO
CHEMICAL ADDITION

estimated at 35% in excess of the stoichiometric values. The observed and calculated sludge production results were compared in the present study during the parallel operation of the combined sludge systems with and without Fe^{+3} addition for a 16-day consecutive period to determine the validity of the stoichiometric equations (Table 1). The calculated sludge production was determined using a procedure similar to that used to determine the theoretical increase in alkalinity consumption due to chemical addition. The ratio of observed to theoretical chemical sludge production was 1.65 (Figure 11).

Whether a separate or combined sludge nitrifying system is employed, some excess biological sludge will result and require subsequent treatment. The addition of alum or ferric iron for phosphorus precipitation might be expected to serve as a sludge conditioner to facilitate dewatering of the excess sludge. Echelberger and Tenney (1969), and Christensen et al (1976) reported that the addition of certain metal ions will serve as conditioners improving the dewatering characteristics of excess sludge. Sludge conditioning involves the addition of large doses of ferric chloride or alum over a short period of time. In this study, with relatively low chemical dosages, parallel operation of the combined sludge systems with and without Al^{+3} or Fe^{+3} did not show any improvement in dewaterability as measured by capillary suction time tests or Buchner funnel tests (Appendix A, Table A3).

3.4 Nitrification Rates

In a carbon removal-nitrification system, heterotrophic bacteria are responsible for organic carbon conversion and autotrophic nitrifying organisms convert ammonia to nitrate. The doubling or generation time for the heterotrophic bacteria is frequently reported as 20 to 40 minutes, whereas for nitrifying bacteria it is in the range of 10 to 30 hours. In a suspended growth or activated sludge system, a direct consequence of the long generation time or slow growth rate of nitrifiers is the requirement to provide a sufficient solids retention time (SRT) to retain an adequate population of these

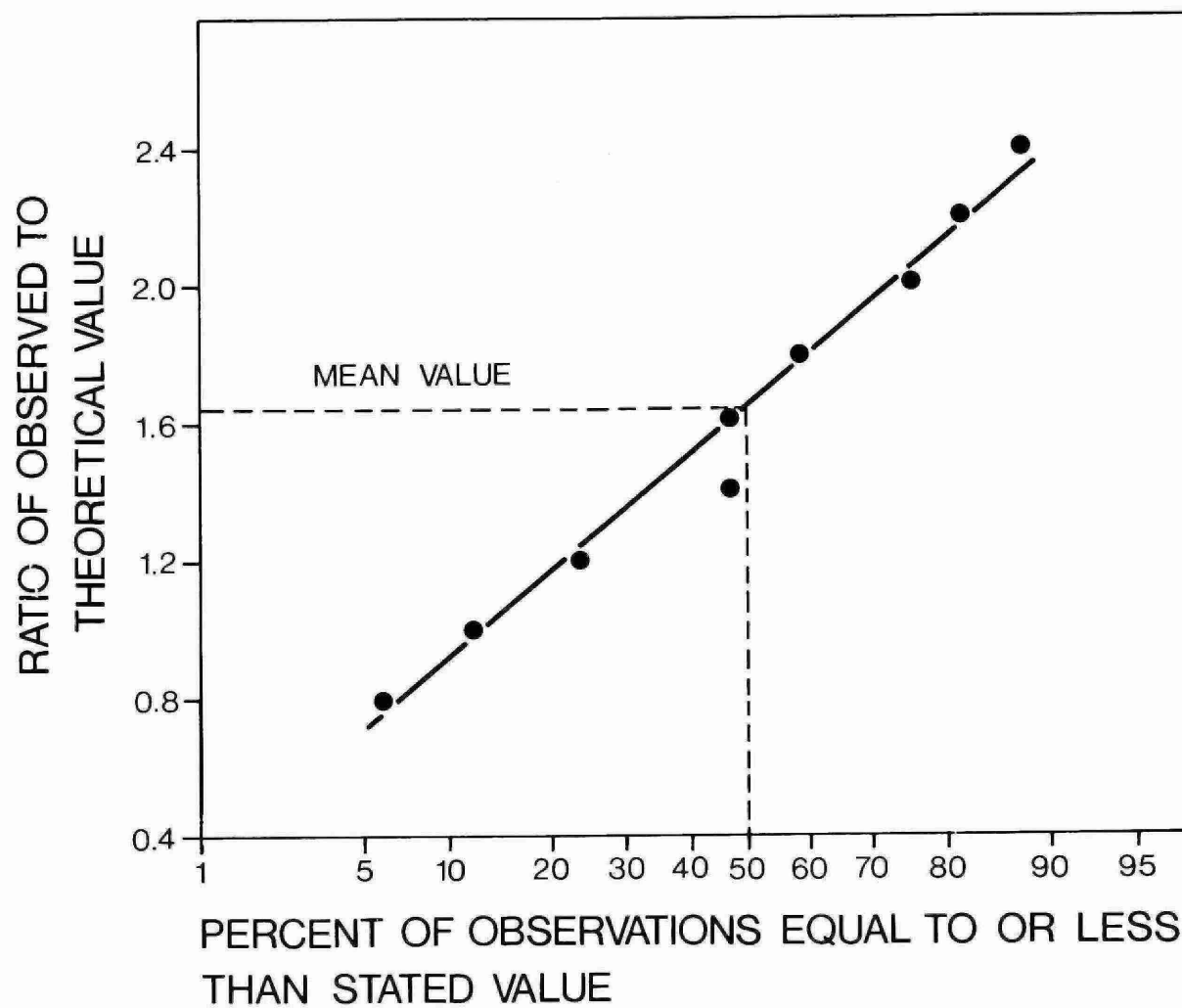


FIGURE 11. SOLIDS PRODUCTION DUE TO FERRIC IRON ADDITION

organisms. The SRT and the growth rate (u) of organisms in an activated sludge system are related by:

$$\text{SRT} = \frac{1}{u} \quad (7)$$

The usual steady-state design procedure for nitrification (U.S. EPA, 1975) involves specifying the SRT necessary, under the given environmental conditions (temperature, pH, etc.), to ensure nitrification. Sutton (1976), under pseudo "steady-state" conditions (constant flow and normal diurnal variations in organic and inorganic concentrations) determined the amount of filterable TKN, as a function of temperature, that could be removed based on 24-hr composite sampling at system SRT's of 10 days in combined and separate sludge nitrifying systems. The combined sludge system relationship describes the data derived in this study from operation of the TSC sludge system without chemical addition (Figure 12). Analysis of variance (ANOVA) verified this observation (Table 8). This same relationship describes the removal data derived during operation of the combined sludge system with Al^{+3} or Fe^{+3} addition (Figure 12, Table 8). Analysis of variance confirmed that the relationship derived by Sutton (1976) for the two-stage separate sludge system, described the removal data derived in this study for the TSS system with Al^{+3} or Fe^{+3} addition (Figure 13, Table 8). These results support the previous paired data analysis (Tables 6 and 7), indicating chemical addition for phosphorus removal has no effect on nitrification provided a constant system SRT is maintained.

An alternative to the SRT approach used in designing nitrification systems involves the use of the unit rate of filterable TKN or NH_4^+ removal. The limitation of this approach is that the unit rate is dependent on the fraction of nitrifiers present in the mass of activated sludge. Under pseudo "steady-state" conditions, the fraction of nitrifiers present is dependent on the influent wastewater organic carbon to inorganic nitrogen (C:N) ratio and the solids retention time. The wide range of unit rates observed by various authors (Figure 14) is likely caused by differences in values of these variables.

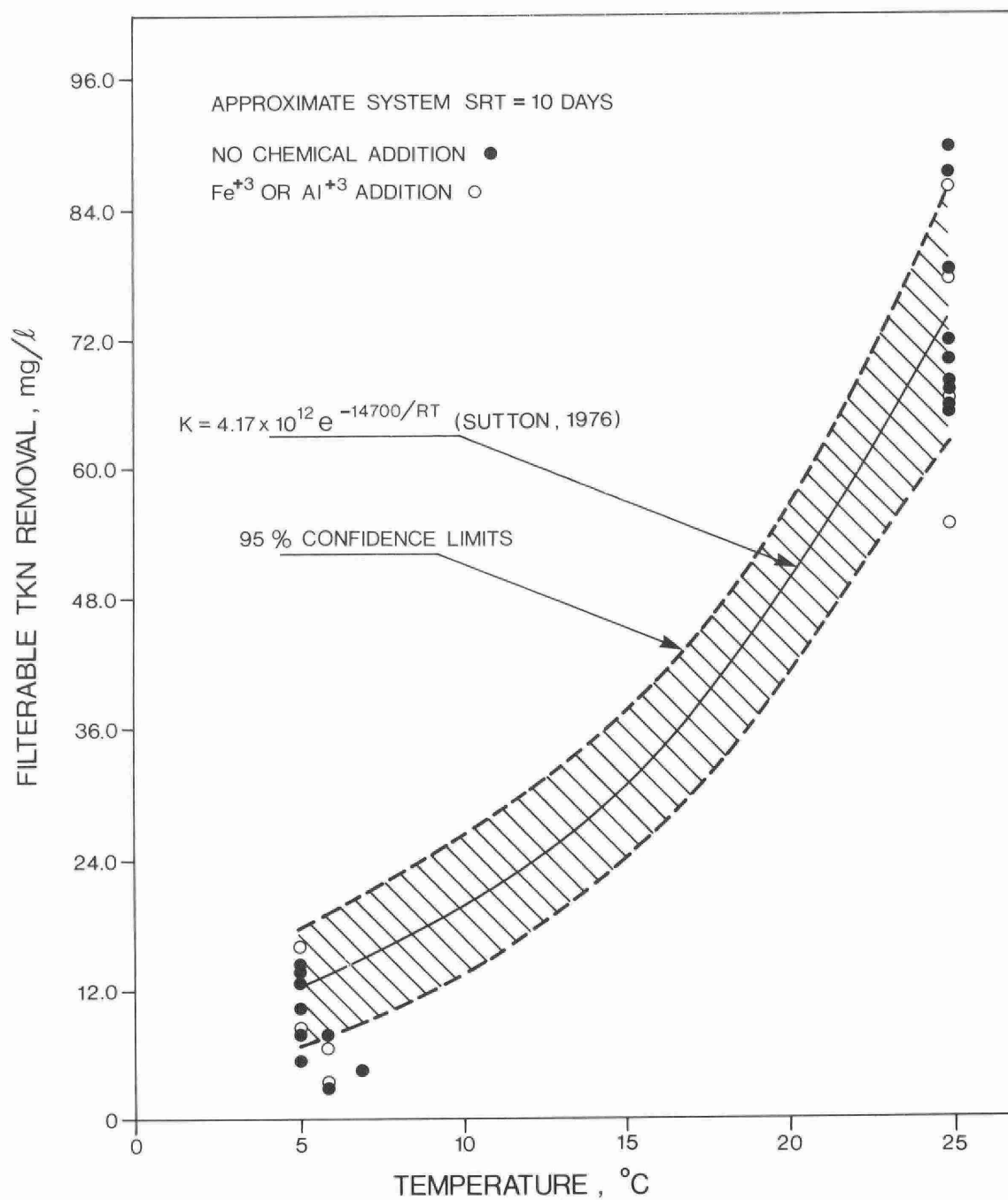


FIGURE 12. TEMPERATURE DEPENDENCY OF NITRIFICATION IN COMBINED SLUDGE SYSTEMS

TABLE 8. FILTERABLE TKN REMOVAL MODELS

Carbon Removal-Nitrification Systems	Analysis of Variance Results	
	$\frac{\text{Mean Square Lack of Fit}}{\text{Mean Square Pure Error}}$	F $\alpha = .95$
Combined Sludge $K = 4.17 \times 10^{12} e^{-14700/RT}$ (Sutton, 1976)		
No Chemical Addition	2.28	3.7
Al^{+3} or Fe^{+3} Addition	1.29	6.6
Separate Sludge $K = 2.58 \times 10^{10} e^{-11720/RT}$ (Sutton, 1976)		
Al^{+3} or Fe^{+3} Addition	2.41	5.1

Note: R is the gas law constant (cal/g-mole).
 T is the temperature in $^{\circ}K$.

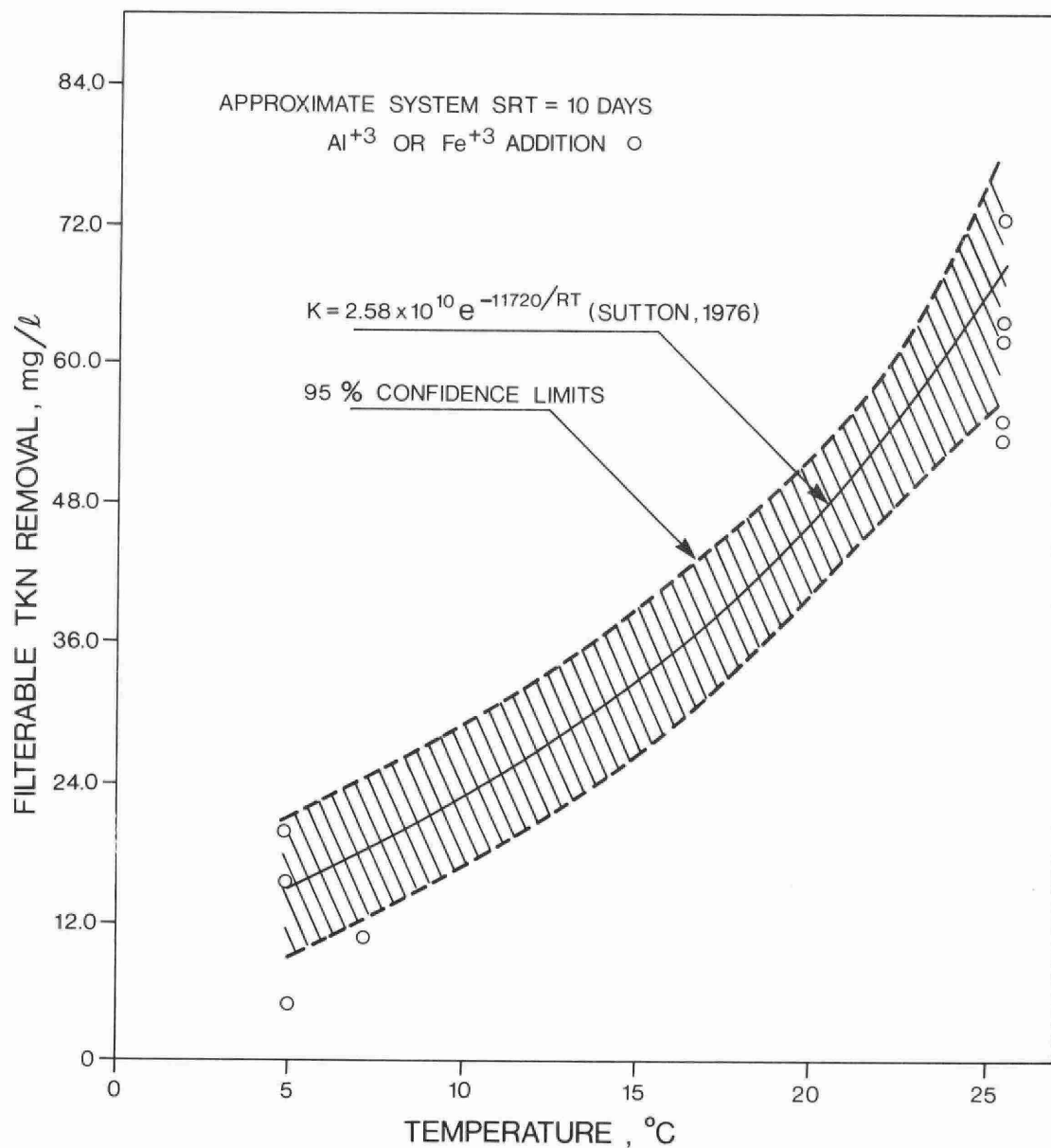


FIGURE 13. TEMPERATURE DEPENDENCY OF NITRIFICATION IN SEPARATE SLUDGE SYSTEM

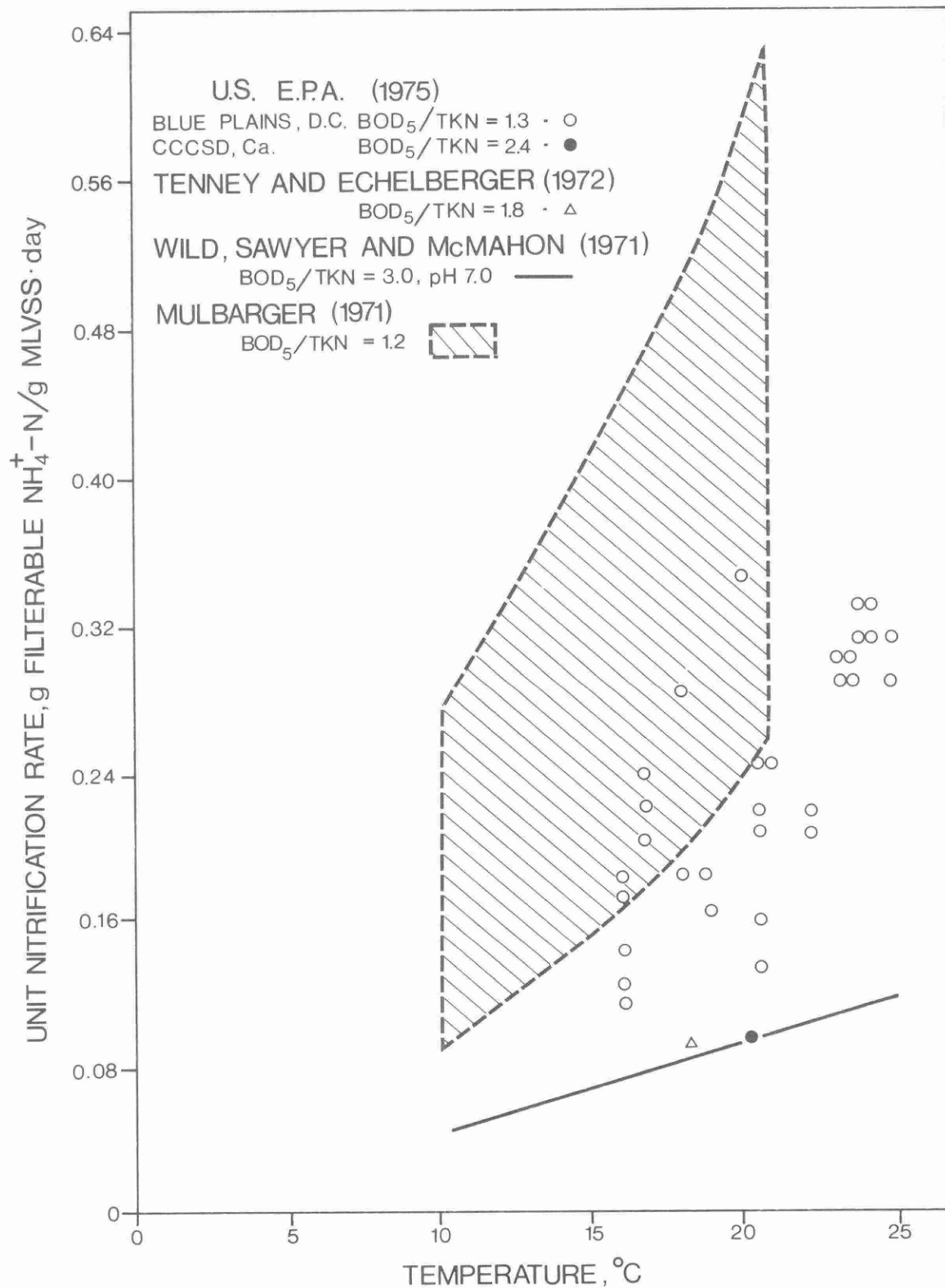


FIGURE 14. NITRIFICATION RATES OBSERVED BY VARIOUS AUTHORS

The addition of Al^{+3} or Fe^{+3} for phosphorus removal within the activated sludge process may further alter the fraction of nitrifiers present in the activated sludge. Although the effect of this factor appears minimal in this study (Figure 15), a wide variation in the unit rates was observed (Figure 16) at the higher temperature level, both with and without the addition of chemicals for P removal. This variation can be attributed to the difference in the raw wastewater C:N ratio, which is directly reflected by the mixed-liquor suspended solids level required to maintain the same system solids retention time during a pseudo "steady-state" operating period (Figure 17). The higher yield of the heterotrophic organisms responsible for organic carbon conversion necessitates maintaining a higher reactor volatile solids concentration at higher influent organic carbon levels in order to maintain the same SRT.

3.5 Variability of Combined Sludge Nitrification Systems

The results of the experiments (Table 5) designed to assess the effluent variability of combined sludge carbon removal-nitrification systems with and without addition for P removal are included in Appendix B.

During experiment V-1, the combined sludge systems, operating under pseudo "steady-state" conditions, exhibited excellent nitrification performance at temperatures down to 5°C. The geometric and arithmetic mean values for the influent filterable TKN over the 16-day consecutive period were 12.3 and 12.8, respectively (Figure 18). Under this loading condition, the combined sludge systems produced an effluent filterable TKN concentration of less than 2.5 mg/l 90% of the time. The results obtained from the reactors operated at SRT's of 10 days could be expected in view of the relationship developed previously describing the filterable TKN removal under pseudo "steady-state" conditions (Figure 12). In comparing the two systems operated at different SRT levels, the influent loading conditions limit any increase in the amount of filterable TKN removal by the reactor operated at a solids retention time of 15 days.

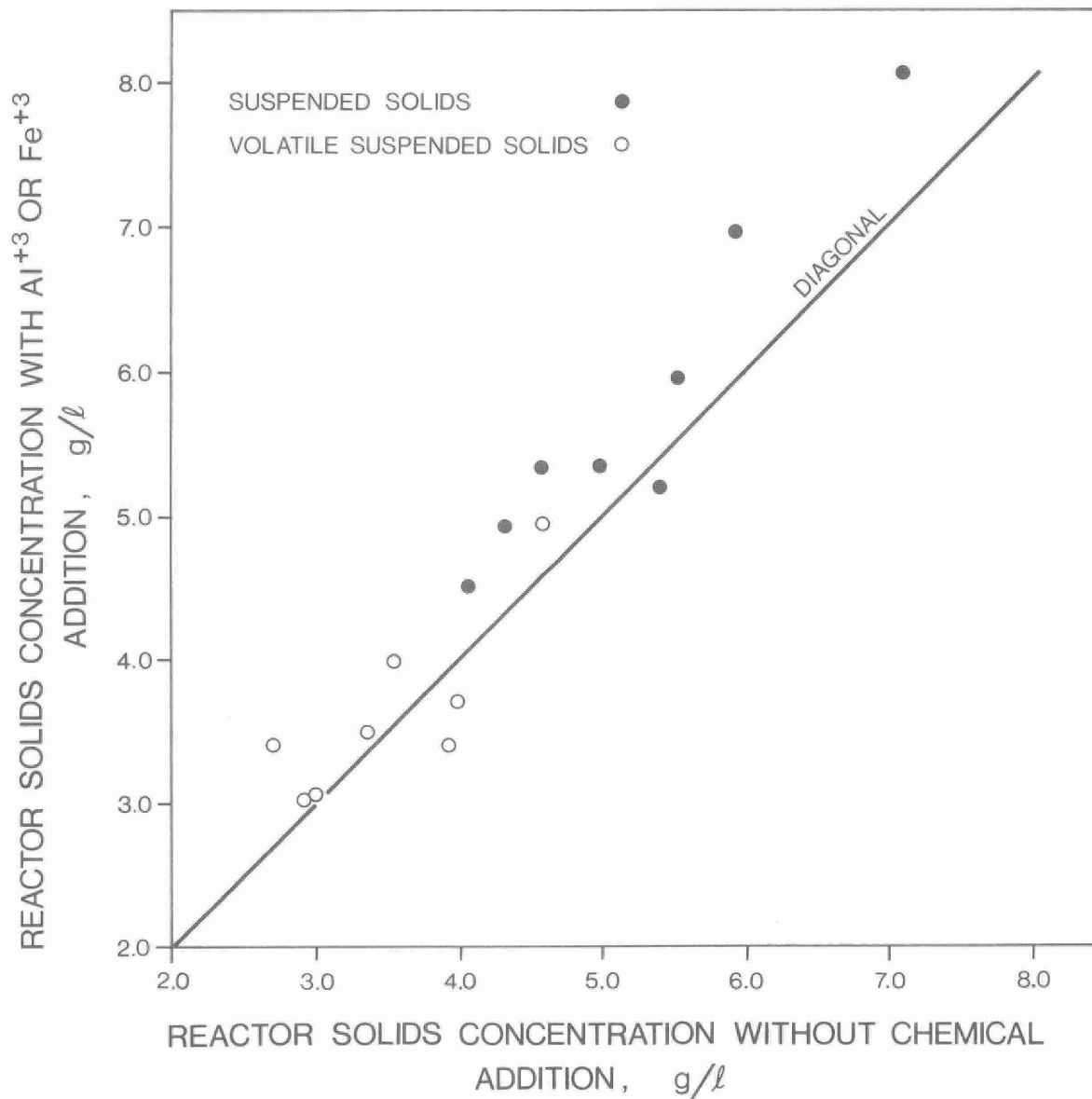


FIGURE 15. PAIRED DATA COMPARISON OF REACTOR SOLIDS CONCENTRATION IN COMBINED SLUDGE SYSTEMS WITH AND WITHOUT CHEMICAL ADDITION

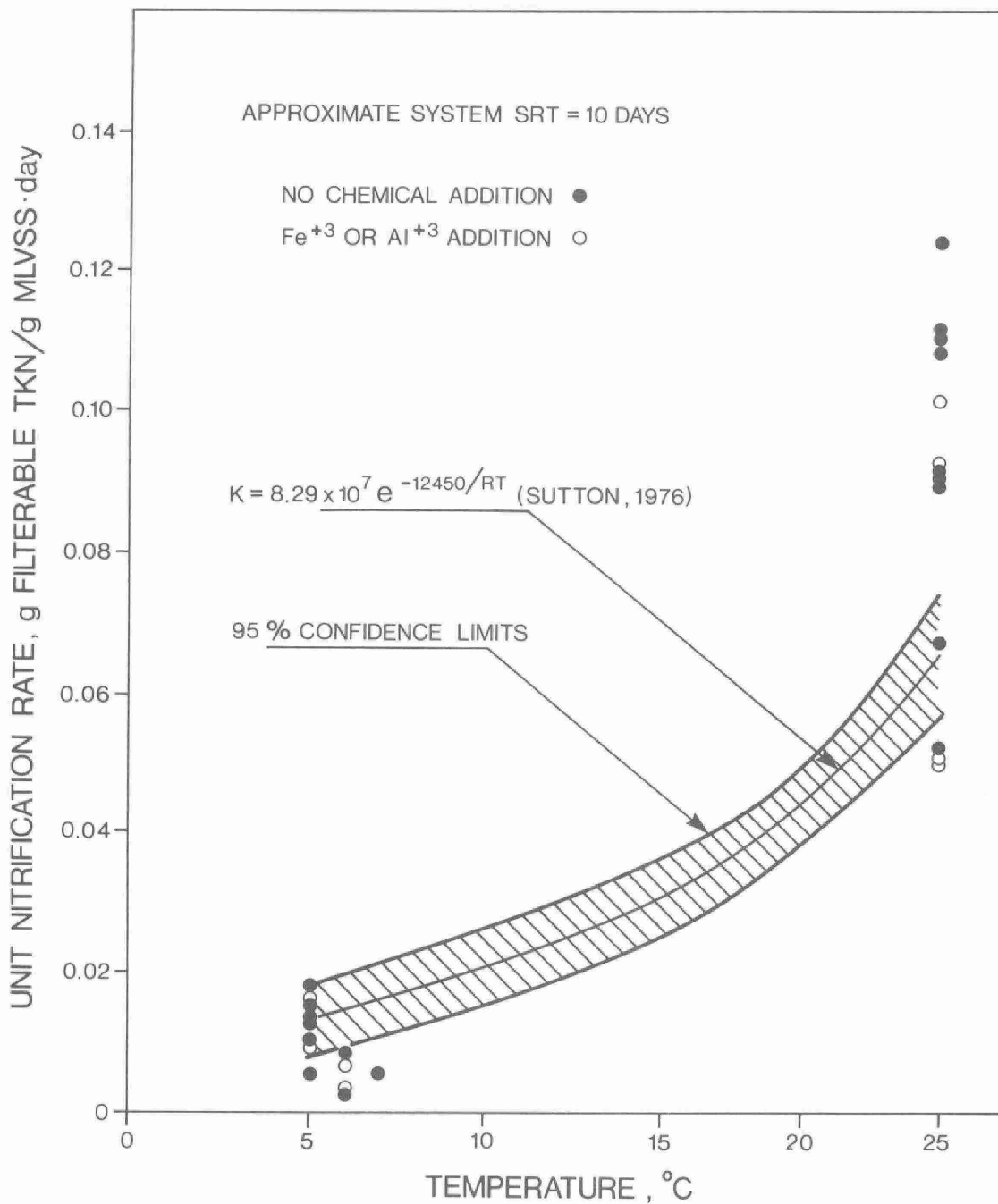


FIGURE 16. TEMPERATURE DEPENDENCY OF THE UNIT RATE OF NITRIFICATION IN COMBINED SLUDGE SYSTEMS

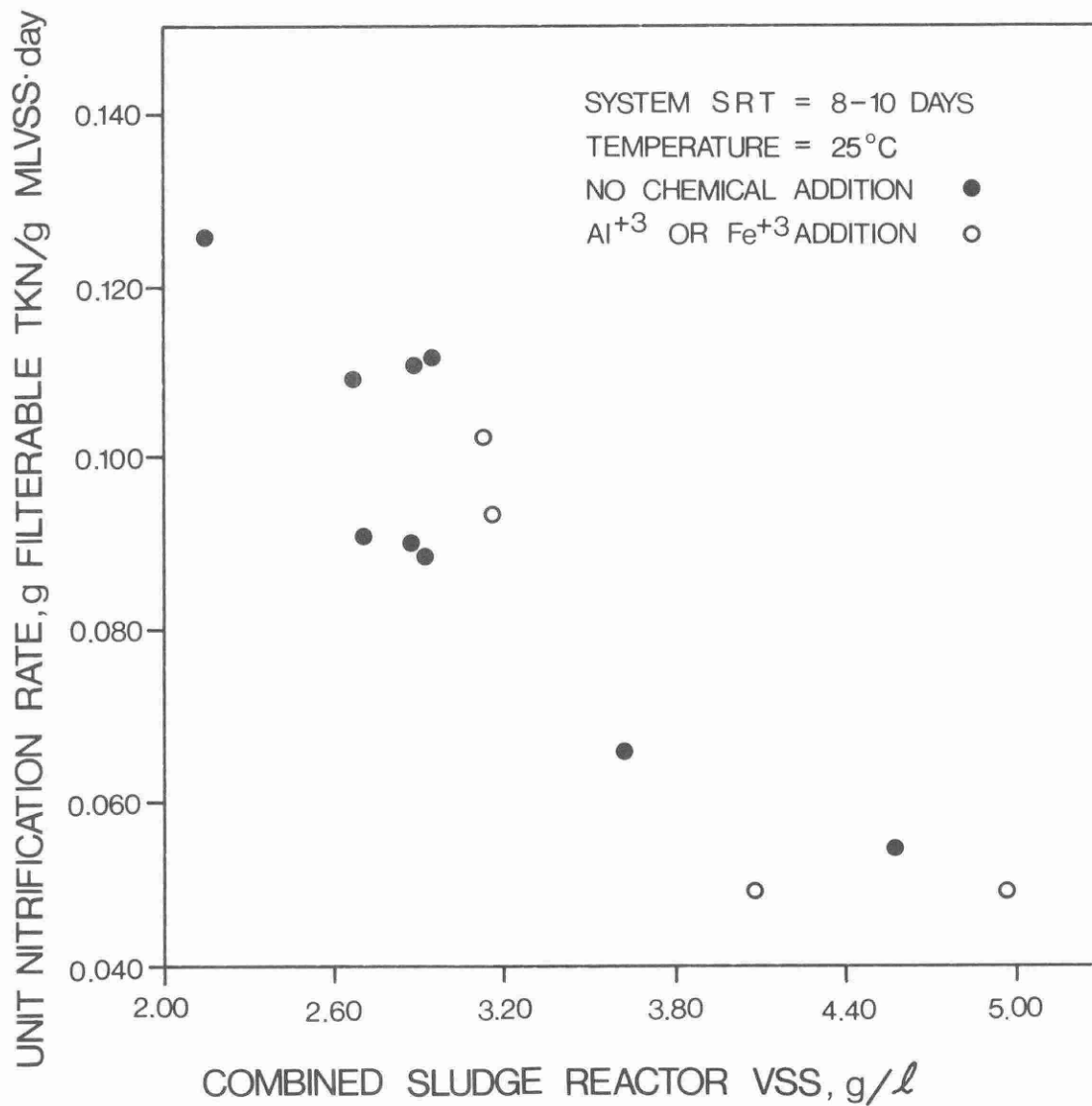


FIGURE 17. NITRIFICATION RATE VARIATION WITH REACTOR VSS AT EQUAL SRT'S

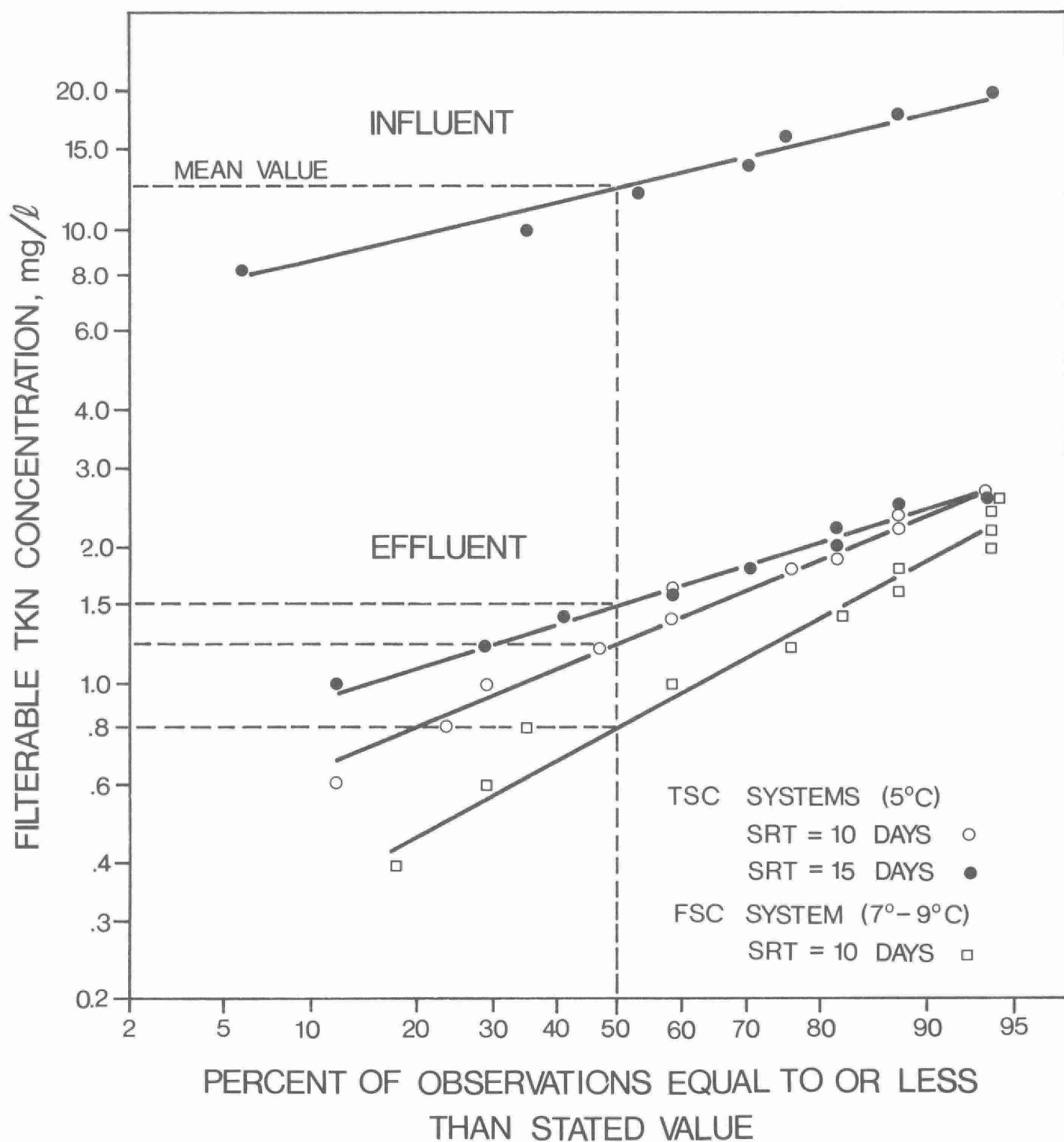


FIGURE 18. DAILY NITRIFICATION VARIABILITY FROM COMBINED SLUDGE SYSTEMS UNDER STEADY FLOW CONDITIONS

In addition to normal diurnal variations in organic and inorganic concentrations, the wastewater flow to the systems was varied in a sinusoidal pattern during experiment V-2 (Figure 21). This resulted in a larger daily mean value and hourly variation for the subsequent TKN loading than encountered under the pseudo "steady-state" conditions of experiment V-1.

The parallel combined sludge systems with and without FeCl_3 addition (15 mg/l Fe^{+3}) removed equal amounts of filterable TKN (Figure 19) verifying the previous paired data analysis. The resulting daily mean filterable effluent TKN values for the system without chemical addition over the 16-day consecutive period (Figure 20), were compared to the predicted values based on the pseudo "steady-state" relationship (Figure 12). The observed values generally fell within the 95% confidence bands. A similar result was found for the system receiving chemical addition. The minimum attainable effluent filterable TKN concentration is 0.9 mg/l , corresponding to complete ammonium nitrogen conversion (Sutton et al, 1975).

Sutton (1976), in operating a combined sludge nitrifying system receiving municipal wastewater under variable flow conditions, found that the effluent concentration from the reactor, operating at 10°C and an SRT of 8 to 10 days, could be predicted quite closely using the same pseudo "steady-state" relationship.

The typical influent variation and effluent response during each day of the experiment are illustrated in Figure 21. The flow-weighted observed and predicted mean results are based on hourly sampling.

In formulating a variation allowance in both the municipal and industrial wastewater categories, the approach by most regulatory agencies is to specify 24-hour maximum and 30-day average values for each parameter (Ford, 1976; Bellanca, 1976). In order to meet such variation allowances for ammonia or TKN, nitrifying activated sludge plants must be designed to reduce the hourly effluent variation and the subsequent daily mean result. To achieve this reduction, the popular approach is to determine the minimum SRT necessary for nitrification under the given environmental conditions (temperature, pH,

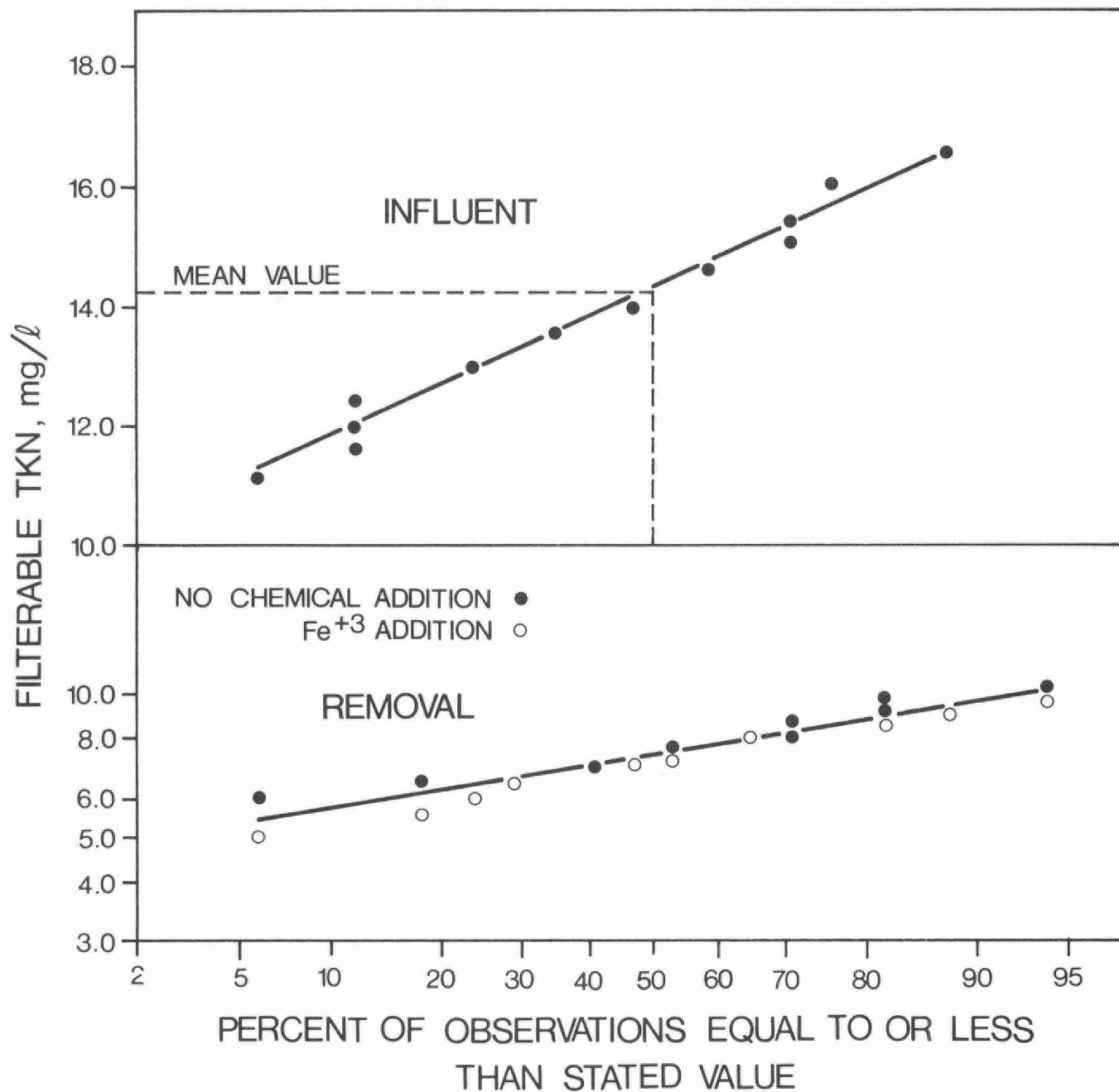


FIGURE 19. DAILY NITRIFICATION VARIABILITY FROM COMBINED SLUDGE SYSTEMS UNDER NON-STEADY FLOW CONDITIONS

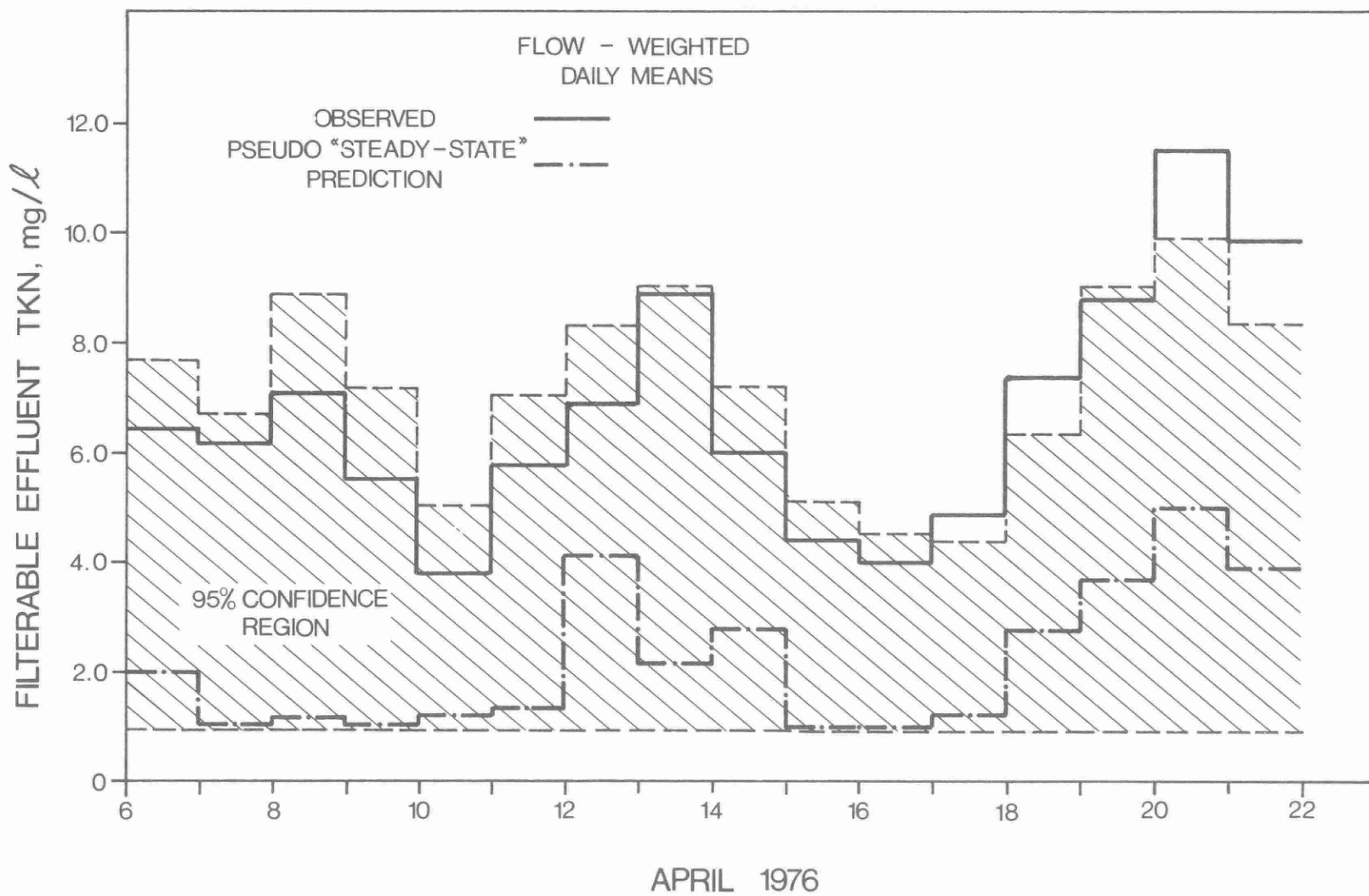


FIGURE 20. DAILY OBSERVED AND PREDICTED EFFLUENT RESULTS UNDER NON-STEADY FLOW CONDITIONS

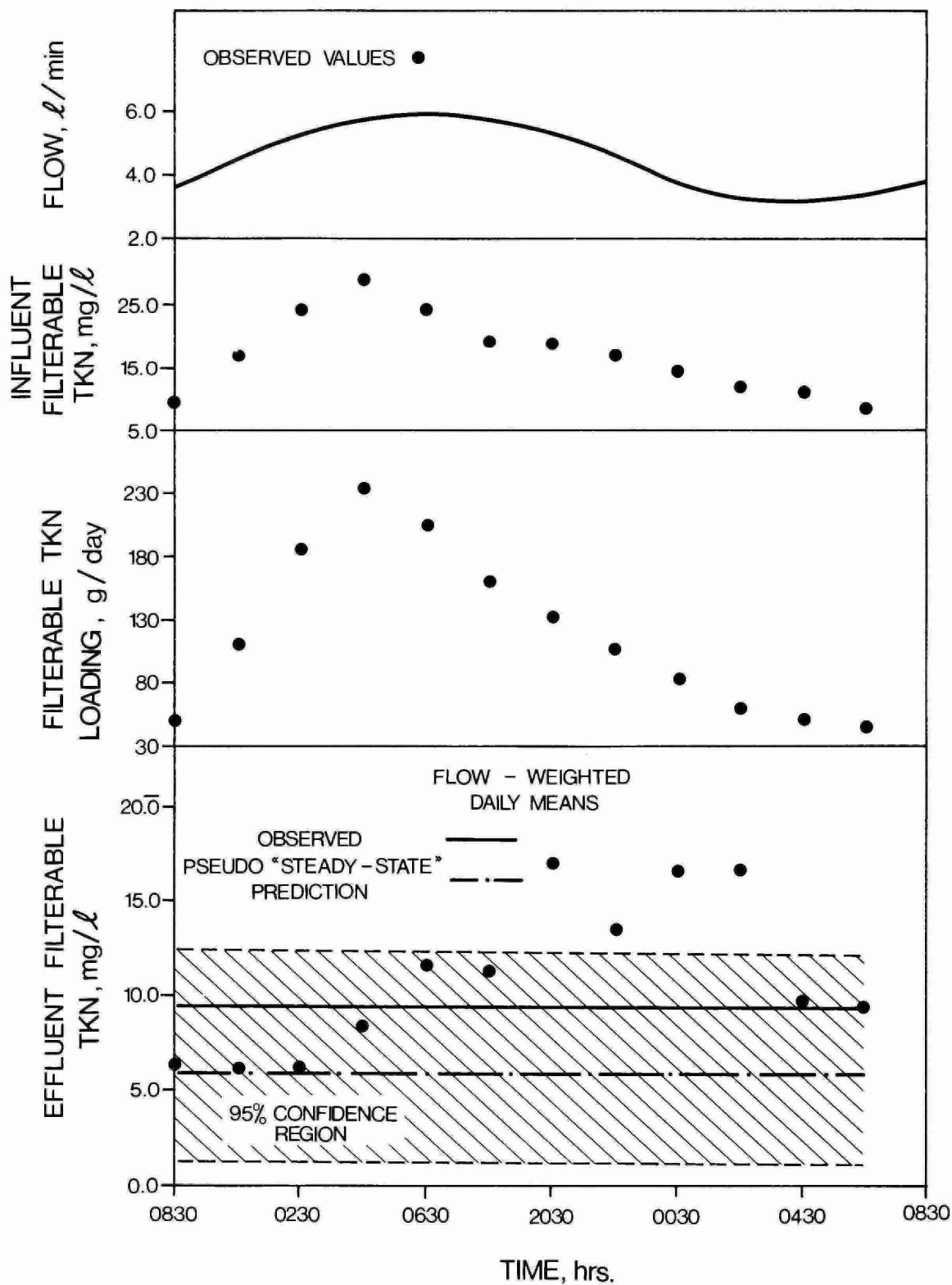


FIGURE 21. TYPICAL INFLUENT AND EFFLUENT DAILY RESULTS UNDER NON-STEADY FLOW CONDITIONS

D0) and then multiply this value by a safety factor, thus determining the design SRT (U.S. EPA, 1975; Lawrence and McCarty, 1970). In designing systems approaching complete mixing, the U.S. EPA (1975) has indicated that the minimum safety factor "should equal or exceed" the ratio of peak ammonia or filterable TKN load to average load. This procedure can be compared to the approach used in this study to predict the mean daily effluent results.

Assuming the influent conditions are as indicated in Figure 21, the pseudo "steady-state" relationship (Figure 12) can be used to determine the temperature necessary to reduce the daily mean effluent filterable TKN to the minimum attainable level. Using the lower 95% confidence limits of the relationship, a temperature of 12.5°C would be required. This is based on a flow-weighted influent daily mean filterable TKN of 18 mg/l. In other words, at 12.5°C, a 10-day SRT would be required.

The design SRT can be calculated according to the U.S. EPA (1975) approach by first determining the minimum SRT for nitrification under the reactor conditions of D0, pH, and temperature, respectively, 2.0 mg/l, 7.2, and 12.5°C. Examination of the filterable TKN loading over the day (Figure 21) indicates a peak to average value of approximately 2.0. Using this as the safety factor and determining the minimum SRT, the calculated design SRT using this approach is nine days.

In designing nitrifying activated sludge systems with integrated phosphorus precipitation, the following should be realized:

1. No significant effect can be expected on the amount of filterable TKN removal or nitrate production with Al^{+3} or Fe^{+3} addition at feed concentrations of approximately 15 mg/l.
2. Combined or separate sludge systems operated at the same system SRT can be expected to give the same degree of nitrification and total filterable phosphorus reduction.
3. The increase in alkalinity demand due to the processes of phosphorus precipitation and hydroxide formation can be estimated using the stoichiometric equations.
4. The increase in sludge production due to chemical addition will be significantly greater than predicted according to the stoichiometric equations.
5. The sludge dewatering characteristics will not be improved with Al^{+3} or Fe^{+3} addition at concentrations of approximately 15 mg/l.

In designing nitrifying activated sludge systems to meet effluent variability criteria for ammonia or filterable TKN the following should be realized:

- a) Under steady or variable flow conditions, the magnitude and variability of the influent filterable TKN loading will affect the system SRT required to produce a consistently low effluent filterable TKN concentration.
- b) Design procedures are available to allow a nitrifying activated sludge plant to be designed to produce an effluent consistently low in filterable TKN at temperatures as low as 5°C.

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APPENDIX A

Pseudo "Steady-State" Experimental Run Results

Solids Retention Time (SRT) Calculation

Analytical Procedures

Theoretical Alkalinity Demand

Sludge Dewatering Characteristics

APPENDIX A

Pseudo "Steady-State" Experimental Run Results

The results of experiments designed to assess the effects of chemical addition on the carbon removal-nitrification systems (Table 4), together with repeated experiments are summarized in Table A1. Included is the fraction of chemical equilibrium achieved calculated using Figure 2. This calculation is based on the SRT of reactor B1 during chemical addition to the two-stage separate sludge system (TSS).

Solids Retention Time (SRT) Calculation

The solids retention time for each reactor-clarifier system is defined as the solids in the aeration tank divided by the solids intentionally wasted and solids lost over the clarifier weir per day. During the pseudo "steady-state" period the calculated SRT is based on a cumulative mean aeration tank MLSS concentration and total solids wasted or lost from the system. For the combined sludge systems (TSC, TSC*, and extended aeration plant), the final result is the system solids retention time (SSRT) for that pseudo "steady-state" period (Table A2). For the separate sludge system (TSS) the SRT for B1 and B2 were calculated in the above manner with the cumulative total wasting, mean MLSS, and SRT for B1, calculated over a period equal to the individual SRT of B1 (one day). The TSS system solids retention time (SSRT) was then calculated weighting the individual SRT's for B1 and B2 according to their aeration tank volumes (Table A2). The dates over which the SSRT was calculated during each pseudo "steady-state" period are indicated in the "Data Listing" section under "Mode of Operation" (Appendix B).

Analytical Procedures

Total Kjeldahl nitrogen

Total Kjeldahl nitrogen analyses (organic plus ammonia nitrogen) were performed according to Technicon Auto-analyser Industrial

TABLE A1. PSEUDO "STEADY-STATE" EXPERIMENTAL RESULTS

Run No.	Date	System Conditions		System Solids Retention Time - days			Chemical Addition	Fraction of Chemical Equilibrium Achieved			System Filterable TKN Removal mg/l		
		Temp. °C	Detention Time hrs.	TSC*	TSS	TSC		TSC	TSS B1	B2	TSC*	TSS	TSC
PSS-1	(1975) 22/7	25	6.4	10	-	9	Fe ⁺ ₃	.76	-	-	89.4	-	85.5
PSS-2	24/7	25	6.4	10	-	9	Fe ⁺ ₃	.81	-	-	85.8	-	77.3
PSS-3	12/8	25	6.4	8	8	-	Fe ⁺ ₃	-	>.95	.91	68.7	61.5	-
PSS-4	18/8	25	6.4	8	8	-	Fe ⁺ ₃	-	>.95	>.95	72.2	63.2	-
PSS-5	1/9	7	6.4	8	8	-	Fe ⁺ ₃	-	>.95	>.95	4.5	10.6	-
PSS-6	3/9	5	6.4	8	8	-	Fe ⁺ ₃	-	>.95	>.95	4.8	4.6	-
PSS-7	18/9	6	6.4	9	-	9	Fe ⁺ ₃	.81	-	-	2.6	-	2.8
PSS-8	22/9	6	6.4	9	-	9	Fe ⁺ ₃	.90	-	-	8.5	-	6.7
PSS-9	9/10	25	6.4	9	-	10	Al ⁺ ₃	.78	-	-	66.6	-	64.8
PSS-10	17/10	25	6.4	9	-	10	Al ⁺ ₃	.90	-	-	64.0	-	53.2
PSS-11	13/11	25	6.4	9	8	-	Al ⁺ ₃	-	>.95	>.95	70.1	53.9	-
PSS-12	18/11	25	6.4	8	8	-	Al ⁺ ₃	-	>.95	>.95	78.3	72.3	-
PSS-13	4/12	5	6.4	10	10	-	Al ⁺ ₃	-	>.95	>.95	12.9	19.4	-
PSS-14	9/14	5	6.4	10	10	-	Al ⁺ ₃	-	>.95	>.95	8.8	15.6	-
PSS-15	†19/12	5	6.4	10	-	-	Al ⁺ ₃	-	-	-	10.8	-	-
PSS-16	(1976) 6/1	5	6.4	9	-	10	Al ⁺ ₃	.94	-	-	13.5	-	15.2
PSS-17	8/1	5	6.4	9	-	10	Al ⁺ ₃	>.95	-	-	13.4	-	8.4
PSS-18	21/1	25	6.4	9	8	-	Fe ⁺ ₃	-	>.95	.80	65.1	-	52.6

Note: * No chemical addition.

† No results for system with chemical addition as SSRT less than eight days.

TABLE A2. SOLIDS RETENTION TIME CALCULATIONS - Runs PSS -13 and -14

TSC SYSTEM

Date	Aeration Tank MLSS g/l				Mean Plant Solids g	Intentional Wasting			Unintentional Wasting g	Total Waste g	Cumul. Total Waste g	Cumul. SRT days
	A1	A2	*A	† Cumul. Mean A		Waste Vol. l	Waste Conc. g/l	Solids Waste g				
(1975)												
2/12	4.86	4.74	4.78	4.78	10440.1	81.9	11.91	975.4	147.4	1122.8	1122.8	9.3
3/12	5.08	4.74	4.86	4.82	10526.9	81.9	10.38	850.1	139.3	989.4	2112.2	10.0
4/12	5.32	5.25	5.27	4.97	10854.5	81.9	10.53	862.4	212.9	1075.3	3187.5	10.2
5/12	5.44	5.33	5.37	5.07	11072.9	81.9 45.4	13.98 10.77	1144.9 490.1	65.5	1700.5	4888.0	9.1
6/12	5.37	5.07	5.17	5.09	11116.6	81.9	11.07	906.6	81.9	988.5	5876.5	9.5
7/12	5.18	4.91	5.00	5.08	11094.7	81.9	10.94	896.0	24.6	920.6	6797.1	9.8
8/12	5.17	5.22	5.20	5.10	11138.4	81.9	10.06	823.9	122.9	946.8	7743.9	10.1
9/12	5.23	4.99	5.07	5.09	11116.6	104.7	11.61	1215.0	143.3	1358.3	9102.2	9.8

Note: * A is weighted MLSS according to A1 and A2 tank volumes.

† Cumul. stands for cumulative.

TABLE A2 (Cont'd). SOLIDS RETENTION TIME CALCULATIONS - Runs PSS -13 and -14

TSS SYSTEM: REACTOR B1

Date	Aeration Tank MLSS g/l		Mean Plant Solids g	Intentional Wasting			Unintentional Wasting g	Total Waste g	Cumul. Total Waste g	Cumul. SRT days
	B1	Cumul. Mean B1		Waste Vol. l	Waste Conc. g/l	Solids Waste g				
(1975)										
2/12	1.42	1.42	1124.6	79.6	7.60	605.0	999.2	1604.2	1604.2	0.7
3/12	2.02	2.02	1599.8	125.6	9.89	1242.0	753.5	1995.5	1995.5	0.8
4/12	2.02	2.02	1417.8	125.6	8.24	1034.8	810.8	1845.6	1845.6	0.8
5/12	2.08	2.08	1647.4	125.6	12.76	1602.7	1113.8	2716.5	2716.5	0.6
6/12	1.55	1.55	1227.6	125.6	6.84	859.1	704.3	1563.4	1563.4	0.8
7/12	0.85	0.85	673.2	83.7	3.35	280.5	384.9	665.4	665.4	1.0
8/12	1.10	1.10	871.2	45.5	5.10	232.0	524.2	756.3	756.3	1.2
9/12	1.24	1.24	982.1	94.2	8.55	805.3	1146.6	1951.9	1951.9	††0.5

TABLE A2 (Cont'd). SOLIDS RETENTION TIME CALCULATIONS - Runs PSS -13 and -14

TSS SYSTEM: REACTOR B2

Date	Aeration Tank MLSS g/l		Mean Plant Solids g	Intentional Wasting			Unintentional Wasting g	Total Waste g	Cumul. Total Waste g	Cumul. SRT days
	B2	Cumul. Mean B2		Waste Vol. l	Waste Conc. g/l	Solids Waste g				
(1975)										
2/12	5.69	5.69	7920.5	54.6	12.60	680.0	81.9	769.9	769.9	10.3
3/12	4.65	5.17	7196.6	9.1	12.42	113.0	57.3	170.3	940.2	15.3
4/12	6.24	5.56	7732.6	36.4	11.96	435.3	81.9	517.2	1457.4	15.9
5/12	6.62	5.83	8108.4	52.8	11.03	582.2	81.9	664.1	2121.5	15.3
6/12	6.60	5.98	8329.7	47.8	12.53	598.6	57.3	655.9	2777.4	15.0
7/12	6.72	6.10	8495.8	45.5	12.52	569.7	16.4	586.1	3363.5	15.2
8/12	6.83	6.20	8636.4	54.6	11.77	642.7	49.1	691.7	4055.2	14.9
8/12	7.40	6.35	8840.1	54.6	12.63	689.6	53.2	742.8	4798.0	††14.7

Note: †† TSS system solids retention time (SSRT) = $\frac{174 (0.5) + 306 (14.7)}{480} = 9.6$

Method 146-71A. Essentially, this procedure consists of digesting organic matter at 380°C, followed by measurement of the ammonia produced using the Berthelot reaction, in which the formation of a blue indophenol complex occurs when ammonia reacts with sodium phenate followed by the addition of sodium hypochlorite. Glycine standards were used for calibration. For keeping unfiltered samples homogenized in the sample cups, the system has two air aspirators. One aspirator provides complete mixing in the cup being sampled, while the second aspirator mixes the next cup on the tray.

Ammonia-nitrogen

Analyses of ammonia-nitrogen were conducted using Technicon Auto-analyser Industrial Method 98-70W. This is essentially the same technique employed for total Kjeldahl nitrogen with the omission of the selenium dioxide/sulphuric acid/perchloric acid digestion step which ammonifies the organic nitrogen fraction. Ammonium chloride standards were used for calibration.

Nitrite

Technicon Auto-analyser Industrial Method 100-70W was used for nitrite-nitrogen determinations. This technique involves a reaction between nitrite and sulphanilamide under acid conditions to form a diazo compound, which in turn is coupled with N-1-naphthylethylenediamine to form a reddish purple azo dye. Colourimetric determination is then made on the sample.

Nitrate plus nitrite

Nitrate plus nitrite-nitrogen analyses were performed using Technicon Auto-analyser Industrial Method 100-70W. In this method, the nitrate-nitrogen is reduced to nitrite in the copper-cadmium reduction column. The sample is then analyzed for nitrite-nitrogen as described previously.

Chemical oxygen demand (COD)

Initially, COD determinations were done according to the dichromate reflux method described in Standard Methods (1971). During the research period, a modified version of Technicon Auto-analyser Industrial Method 268-73W was adapted for COD analysis. A technicon Solidprep 11 sampler was introduced in place of the normal sampler. This allowed analysis of samples containing suspended solids and provided high shear homogenization of samples with the dichromate and sulphuric acid reagents. Standard solutions were prepared using ammonium chloride. The standards were first analyzed using the "Standard Methods" reflux technique and then analyzed on the Technicon equipment. The standard peaks produced on the Technicon System were then calibrated against the "Standard Methods" results. This complicated approach was necessary since the sample digestion time in the Auto-analyser was shorter than that in the standard reflux test. This resulted in a slightly lower degree of reaction completion with the Auto-analyser when heterogeneous sewage samples were tested.

Biochemical oxygen demand (BOD)

The five-day, 20°C BOD determinations were performed according to the method described in Standard Methods (1971).

Filterable organic carbon (FOC)

Twenty microlitre samples previously acidified and purged were injected into a Beckman Infrared Carbon Analyser. The resulting peaks were compared to a calibration curve prepared from standards using anhydrous potassium biphthalate.

Suspended solids

Gelman .3 micron glass fibre filters were dried, but not washed, for at least two hours in a 103°C oven. They were then cooled in a dessicator and weighed. Suspended solids determinations were made by filtering a minimum of 10 ml of solution through a filter.

The filter was then redried at 103°C for two or more hours, dessicated for 15 minutes, and reweighed. The increase in weight was taken as a measure of the suspended solids.

Volatile suspended solids

This determination was made by igniting the glass fibre filter containing the residue from the suspended solids test in an electric muffle furnace at 550°C for 15 minutes. Following dessication, the filter was then reweighed and the decrease in weight from the dried paper following the suspended solids determination was taken as a measure of the volatile suspended solids.

Dissolved oxygen

An Electronic Instruments Limited Dissolved Oxygen Meter Model 15A was used for dissolved oxygen determinations. It was found necessary to calibrate the probe once a week.

Temperature

The DO meter also included a temperature probe and this was used for measurement of the feed stream and the reactor temperatures.

pH

pH was measured using an Orion Specific Ion Meter (Model 410) together with Fisher Combination electrodes (Cat. 13-639-90).

Alkalinity

Alkalinity was determined in accordance with Standard Methods (1971) where 50 ml samples are titrated to a pH of 4.3 by addition of .02 N sulphuric acid. Results are expressed as mg/l as calcium carbonate.

Theoretical alkalinity demand

The validity of determining the increase in alkalinity consumption by use of the stoichiometric equations was assessed by comparing the observed and calculated values during the parallel operation of combined sludge systems with and without Fe^{+3} addition for a 16 consecutive day period (Table 5). During this period, chemical addition was to Plant A. In calculating the alkalinity demand for phosphorus precipitation, according to the theoretical equations (Table 1), phosphorus is assumed to be in the form H_2PO_4^- under the given influent pH conditions (Conn and Stumpf, 1963). Using the "Analyses" and "Mode of Operation" results (Appendix B), together with the theoretical equations (Table 1), an example calculation is given below for one day during the 16-day consecutive period.

Example calculation (14/4/76)

Quantity Fe^{+3} added	= 18 mg/l
Influent filtered TP	= 2.9 mg/l
Plant A effluent filtered TP	= 0.2 mg/l
Therefore filtered TP removed Plant A	= 2.7 mg/l
Plant B effluent filtered TP	= 1.4 mg/l
Therefore filtered TP removed plant B	= 1.5 mg/l
Therefore filtered TP removed by precipitation	= 1.2 mg/l
Therefore alkalinity required in precipitation (equation 5)	= 3.8 mg/l (as CaCO_3)
Fe^{+3} required in precipitation reaction (equation 5)	= 2.16 mg/l
Therefore Fe^{+3} remaining	= 5.84 mg/l
Therefore alkalinity required in hydrolysis reaction (equation 6)	= 42.77 mg/l
Therefore total theoretical alkalinity required for precipitation and hydrolysis	= 46.57 mg/l (as CaCO_3)
Observed alkalinity consumed (effluent alkalinity Plant B - effluent alkalinity Plant A)	= 62 mg/l (as CaCO_3)
Therefore ratio of observed to theoretical	= 1.33

Sludge Dewatering Characteristics

In order to assess the effects of chemical addition on the sludge dewatering characteristics, capillary suction time tests (Baskerville and Gale, 1968) and Buchner funnel tests, leading to a value for the specific resistance (Eckenfelder and Ford, 1970), were carried out during parallel operation of the combined sludge systems with and without chemical addition. The results (Table A3) do not show any improvement in dewaterability characteristics with Al^{+3} or Fe^{+3} addition.

TABLE A3. SLUDGE DEWATERING CHARACTERISTICS WITH AND WITHOUT CHEMICAL ADDITION

Date	Temp. °C	Chemical Addition	Capillary Suction Time, sec.		Specific Resistance $\times 10^{-9}$, sec ² /g	
			TSC	TSC*	TSC	TSC*
(1975)						
22/7	25	Fe ⁺ ₃	8.8	6.8	1.59	1.37
24/7	25	Fe ⁺ ₃	7.8	6.9	1.81	0.77
18/9	5	Fe ⁺ ₃	12.7	9.4	2.85	0.99
22/9	5	Fe ⁺ ₃	17.2	8.0	3.47	0.85
9/10	25	Al ⁺ ₃	18.4	16.3	1.51	2.31
17/10	25	Al ⁺ ₃	19.3	16.0	2.20	2.56
(1976)						
6/1	5	Al ⁺ ₃	8.4	9.8	0.86	4.58
8/1	5	Al ⁺ ₃	-	-	1.34	5.83

Note: TSC* is TSC without Al⁺₃ or Fe⁺₃ addition.

APPENDIX B

Data Listing - Mode of Operation, Reactor
Operating Results, Analyses

APPENDIX B

Data Listing - Mode of Operation, Reactor Operating Results, Analyses

The complete pilot plant data listing, composed of three sections, appears on the following pages. Contained under "Mode of Operation" is a chronological listing of information concerning pilot plant flow rates, operating reactor or mode, and raw sewage characteristics. This section also lists information on plant upsets, identifies acclimation and chemical addition periods, and notes the period over which the SSRT calculation was made for each plant. Contained under "Reactor Operating Results" is a chronological listing of the solids concentrations in the reactors, the waste concentrations and amounts, and other reactor characteristics such as pH, temperature, etc. Some clarifier effluent characteristics are also listed for the reactor systems. Contained under "Analyses" is a chronological listing of analytically determined results for the various reactor streams.

The abbreviations and symbols used in the data listing and in the main body of the report are interpreted in Appendix C.

MODE OF OPERATION

DAY	MON	YR	OPERATING MODE A B	FEED RATE		RETURN SLUDGE RATE		----RAW SEWAGE----				CHEMICAL ADDITION	
				A	B	A	B2	PH	SS	SS	ALK	RATE	CHEM
11	07	75	START-UP PLANTS A(TSC) AND B(TSC*)										
11	07	75	PILOT PLANT, FERRIC CHLORIDE ADDITION TO PLANT B AT SUCTION SIDE										
11	07	75	OF RETURN SLUDGE PUMP, ACCLIMATING TO SSRT 10 DAYS AND TEMP. 25 C										
11	07	75	1 1 2	1.25	1.25	1.25	1.25					18	FE
12	07	75	1 1 2	1.25	1.25	1.25	1.25					18	FE
13	07	75	1 1 2	1.25	1.25	1.25	1.25					18	FE
14	07	75	1 1 2	1.25	1.25	1.25	1.25					18	FE
15	07	75	1 1 2	1.25	1.25	1.25	1.25					11	FE
16	07	75	1 1 2	1.25	1.25	1.25	1.25					332	FE
17	07	75	1 1 2	1.25	1.25	1.25	1.25					208	FE
18	07	75	1 1 2	1.25	1.25	1.25	1.25					284	FE
19	07	75	1 1 2	1.25	1.25	1.25	1.25					10	FE
20	07	75	1 1 2	1.25	1.25	1.25	1.25					10	FE
21	07	75	1 1 2	1.25	1.25	1.25	1.25					19	FE
21	07	75	ACCLIMATION PLANTS A AND B COMPLETE. SSRT PLANT A AND B										
21	07	75	CALCULATIONS BASED FROM (21/07/75) TO (24/07/75)										
21	07	75	AMMONIA AND ALKALINITY SPIKE STARTED 1400 HRS TO TEMP. CONTROLLER										
21	07	75	FOR RATE DAY(22/07/75)										
21	07	75	1 1 2	1.25	1.25	1.25	1.25					76	FE
22	07	75	1 1 2	1.25	1.25	1.25	1.25					272 164	FE
23	07	75	AMMONIA AND ALKALINITY SPIKE STARTED 1400 HRS TO TEMP CONTROLLER										
23	07	75	FOR RATE DAY(22/07/75)										
23	07	75	1 1 2	1.25	1.25	1.25	1.25					7.8 140	FE
24	07	75	1 1 2	1.25	1.25	1.25	1.25					7.9 116 184 536	FE
25	07	75	CHANGE B SYSTEM FROM TSC TO TSS										
25	07	75	FERRIC CHLORIDE SPIKE HOOKED UP TO SUCTION END OF RETURN SLUDGE										
25	07	75	PUMP B1										
25	07	75	ACCLIMATING PLANTS A(TSC*) AND B(TSS) TO SSRT 10 DAYS AND TEMP 25 C										
25	07	75	1 1 3	1.25	1.25	1.25	1.25					140	FE
26	07	75	1 1 3	1.25	1.25	1.25	1.25					13	FE
27	07	75	1 1 3	1.25	1.25	1.25	1.25					13	FE
28	07	75	1 1 3	1.25	1.25	1.25	1.25					10	FE
29	07	75	1 1 3	1.25	1.25	1.25	1.25					204	FE
30	07	75	1 1 3	1.25	1.25	1.25	1.25					268	FE
31	07	75	1 1 3	1.25	1.25	1.25	1.25					240	FE
01	08	75	1 1 3	1.25	1.25	1.25	1.25					300	FE
02	08	75	1 1 3	1.25	1.25	1.25	1.25					17	FE
03	08	75	1 1 3	1.25	1.25	1.25	1.25					17	FE
04	08	75	PILOT PLANT FOUND OFF IN AM DUE TO POWER INTERRUPTION, PLANT OFF										
04	08	75	UNKNOWN LENGTH OF TIME										
04	08	75	1 1 3	1.25	1.25	1.25	1.25					17	FE
05	08	75	TRANSFERRED 6 IGAL RETURN SLUDGE A INTO AERATION TANK B2 (1000 HRS)										
05	08	75	TRANSFERRED 8 IGAL RETURN SLUDGE A INTO AERATION TANK B2 (1600 HRS)										
05	08	75	1 1 3	1.25	1.25	1.25	1.25					44	FE
06	08	75	TRANSFERRED 15 IGAL RETURN SLUDGE A INTO AERATION TANK B2 (1200 HRS)										
06	08	75	AMMONIA AND ALKALINITY SPIKE STARTED 1400 HRS TO TEMP. CONTROLLER										
06	08	75	1 1 3	1.25	1.25	1.25	1.25					36	FE
07	08	75	TRANSFERRED 15 IGAL RETURN SLUDGE A INTO AERATION TANK B2										
07	08	75	1 1 3	1.25	1.25	1.25	1.25					7.1 56	FE
08	08	75	1 1 3	1.25	1.25	1.25	1.25					64	FE
09	08	75	1 1 3	1.25	1.25	1.25	1.25					11	FE
10	08	75	1 1 3	1.25	1.25	1.25	1.25					13	FE
10	08	75	ACCLIMATION PLANTS A AND B COMPLETE. SSRT PLANT A AND B										
11	08	75	CALCULATIONS BASED FROM (11/08/75) TO (18/08/75)										
11	08	75	AMMONIA AND ALKALINITY SPIKE STARTED 1400 HRS TO TEMP. CONTROLLER										
11	08	75	FOR RATE DAY(12/08/75)										
11	08	75	1 1 3	1.25	1.25	1.25	1.25					232 168	FE
12	08	75	1 1 3	1.25	1.25	1.25	1.25					7.2 124	FE
13	08	75	1 1 3	1.25	1.25	1.25	1.25					485	FE
14	08	75	1 1 3	1.25	1.25	1.25	1.25					102	FE

MODE OF OPERATION

DAY	MCN	YR	OPERATING MODE A B	FEED RATE A B	RETURN SLUDGE RATE A B1 B2	----RAW SEWAGE----	CHEMICAL ADDITION
						PH SS PH SS ALK	RATE CHEM
15	08	75	1 3	1.25 1.25	1.25 1.25 1.25	104	14 FE
16	08	75	1 3	1.25 1.25	1.25 1.25 1.25	210	13 FE
17	08	75	AMMONIA AND ALKALINITY SPIKE STARTED			1330 HRS TO TEMP. CONTROLLER	
17	08	75	FOR RATE DAY (18/08/75)				
17	08	75	1 3	1.25 1.25	1.25 1.25 1.25		13 FE
18	08	75	1 3	1.25 1.25	1.25 1.25 1.25	7.3 170 180 580	11 FE
19	08	75	LOWERED TEMP IN SYSTEMS A AND B FROM 25 C TO 5 C				
19	08	75	ACCLIMATING PLANTS A (TSC*) AND B (TSS) TO SSRT 10 DAYS AND TEMP			200	13 FE 5 C
20	08	75	CLARIFIER A AND B2 RACKS WERE FOUND OFF				
20	08	75	1 3	1.25 1.25	1.25 1.25 1.25		17 FE
22	08	75	TRANSFERRED 15 IGAL RETURN SLUDGE A INTO AERATION TANK B2 (1130 HRS)			100	FE
22	08	75	1 3	1.25 1.25	1.25 1.25 1.25	108	FE
23	08	75	1 3	1.25 1.25	1.25 1.25 1.25		19 FE
24	08	75	1 3	1.25 1.25	1.25 1.25 1.25		12 FE
25	08	75	1 3	1.25 1.25	1.25 1.25 1.25	240	12 FE
26	08	75	1 3	1.25 1.25	1.25 1.25 1.25	224	15 FE
27	08	75	1 3	1.25 1.25	1.25 1.25 1.25	140	19 FE
28	08	75	1 3	1.25 1.25	1.25 1.25 1.25	7.3 448	19 FE
29	08	75	1 3	1.25 1.25	1.25 1.25 1.25	7.3 308	15 FE
30	08	75	1 3	1.25 1.25	1.25 1.25 1.25		15 FE
31	08	75	ACCLIMATION PLANTS A AND B COMPLETE. SSRT PLANT A AND B				
31	08	75	CALCULATIONS BASED FROM (01/09/75) TO (03/09/75)				
01	09	75	1 3	1.25 1.25	1.25 1.25 1.25	7.4 228 160 247	15 FE
02	09	75	1 3	1.25 1.25	1.25 1.25 1.25	248	13 FE
03	09	75	1 3	1.25 1.25	1.25 1.25 1.25	7.5 360 232 249	13 FE
04	09	75	CHANGE B SYSTEM FROM TSS TO TSC				
04	09	75	FERRIC CHLORIDE SPIKE HOOKED UP TO SUCTION END OF RETURN SLUDGE				
04	09	75	PUMP B2				
04	09	75	ACCLIMATING PLANTS A (TSC*) AND B (TSC) TO SSRT 10 DAYS AND TEMP			154	75 FE 5 C
05	09	75	1 3	1.25 1.25	1.25 1.25 1.25		42 FE
06	09	75	FERRIC CHLORIDE SPIKE STOPPED FOR 48 HRS, BECAUSE PREVIOUS DAYS RATE				
06	09	75	PUMPED WAS IN EXCESS				
07	09	75	1 2	1.25 1.25	1.25 1.25		
08	09	75	1 2	1.25 1.25	1.25 1.25		
09	09	75	1 2	1.25 1.25	1.25 1.25		22 FE
10	09	75	1 2	1.25 1.25	1.25 1.25		16 FE
11	09	75	1 2	1.25 1.25	1.25 1.25		17 FE
12	09	75	1 2	1.25 1.25	1.25 1.25	176	17 FE
13	09	75	1 2	1.25 1.25	1.25 1.25		17 FE
14	09	75	1 2	1.25 1.25	1.25 1.25		17 FE
15	09	75	ACCLIMATION PLANTS A AND B COMPLETE. SSRT PLANT A AND B				
15	09	75	CALCULATIONS BASED FROM (15/09/75) TO (22/09/75)				
16	09	75	1 2	1.25 1.25	1.25 1.25	400	17 FE
17	09	75	1 2	1.25 1.25	1.25 1.25	7.5 284	20 FE
18	09	75	1 2	1.25 1.25	1.25 1.25	7.7 140	15 FE
19	09	75	1 2	1.25 1.25	1.25 1.25	7.4 84 188 187	15 FE
20	09	75	1 2	1.25 1.25	1.25 1.25		16 FE
21	09	75	1 2	1.25 1.25	1.25 1.25	56	15 FE
22	09	75	1 2	1.25 1.25	1.25 1.25	96	15 FE
23	09	75	1 2	1.25 1.25	1.25 1.25	7.8 75 254 279	
23	09	75	STOPPED FEEDING FERRIC CHLORIDE, DUMPED B SYSTEM AND CLEANED; USED				
23	09	75	RETURN SLUDGE FROM A SYSTEM TO FILL B SYSTEM BACK UP TO APPROX. 3000				
23	09	75	MG/L HLSS. TEMPERATURE SET TO 25 C				
23	09	75	1 2	1.25 1.25	2.2 2.2	128	

MODE OF OPERATION

DAY	MON	YR	OPERATING MODE		FEED RATE A B	RETURN SLUDGE RATE		----RAW SEWAGE----				CHEMICAL ADDITION			
			A	B		A	B	PH	AM SS	PM SS	ALK	RATE	CHEM		
24	09	PLANT	SHUT DOWN FOR 4 HRS DUE TO POWER INTERRUPTION, TEMP. INCREASED												
24	09	25 C													
24	09	75	1	2	1.25	1.25	1.25	1.25							
24	09	75	ALUM ADDITION TO PLANT B AT SUCTION SIDE OF RETURN SLUDGE PUMP												
24	09	75	ACCLIMATING PLANTS A (TSC*) AND B (TSS) TO SSRT 10 DAYS AND TEMP 25 C												
24	09	75	1	2	1.25	1.25	1.25	1.25					10	AL	
24	09	75	1	2	1.25	1.25	1.25	1.25					10	AL	
24	09	75	1	2	1.25	1.25	1.25	1.25					10	AL	
24	09	75	1	2	1.25	1.25	1.25	1.25					10	AL	
24	09	75	1	2	1.25	1.25	1.25	1.25					10	AL	
24	09	75	1	2	1.25	1.25	1.25	1.25	7.5	128			10	AL	
24	09	75	1	2	1.25	1.25	1.25	1.25	7.5	216			10	AL	
24	10	75	1	2	1.25	1.25	1.25	1.25					8	AL	
24	10	75	1	2	1.25	1.25	1.25	1.25					9	AL	
24	10	75	1	2	1.25	1.25	1.25	1.25					10	AL	
24	10	75	1	2	1.25	1.25	1.25	1.25					10	AL	
24	10	75	1	2	1.25	1.25	1.25	1.25					10	AL	
24	10	75	1	2	1.25	1.25	1.25	1.25	7.4	536			9	AL	
24	10	75	1	2	1.25	1.25	1.25	1.25					9	AL	
24	10	75	AMMONIA AND ALKALINITY SPIKE STARTED 1630 HRS TO TEMP. CONTROLLER												
24	10	75	FOR RATE DAY (09/10/75)												
24	10	75	ACCLIMATING PLANTS A AND B COMPLETE. SSRT PLANT A AND B												
24	10	75	CALCULATIONS BASED FROM (08/10/75) TO (17/10/75)												
24	10	75	1	2	1.25	1.25	1.25	1.25	7.5	416			8	AL	
24	10	75	1	2	1.25	1.25	1.25	1.25	8.0	420	316	461	8	AL	
24	10	75	ALUM ADDITION STOPPED FOR 72 HRS												
24	10	75	1	2	1.25	1.25	1.25	1.25					322		
24	10	75	1	2	1.25	1.25	1.25	1.25					336		
24	10	75	1	2	1.25	1.25	1.25	1.25					252		
24	10	75	1	2	1.25	1.25	1.25	1.25					300		
24	10	75	10 PLANT WITHOUT RAW SEWAGE FOR APPROX. 15 HRS, HIGH RATE CLARIFIER VALVE												
24	10	75	FOUND OPEN												
24	10	75	DUE TO INTERRUPTION OF RAW SEWAGE ALUM SPIKE STOPPED FOR TODAY ONLY												
24	10	75	1	2	1.25	1.25	1.25	1.25					760	AL	
24	10	75	1	2	1.25	1.25	1.25	1.25	7.3	268			11	AL	
24	10	75	AMMONIA AND ALKALINITY SPIKE STARTED 1645 HRS TO TEMP. CONTROLLER												
24	10	75	FOR RATE DAY (17/10/75)												
24	10	75	1	2	1.25	1.25	1.25	1.25	7.6	200			10	AL	
24	10	75	1	2	1.25	1.25	1.25	1.25	7.6	256	220	440	11	AL	
24	10	75	CHANGE B PLANT FROM TSC* TO TSS WITH RETURN SLUDGE PUMP B1 SET												
24	10	75	TO 0.31 IGPM												
24	10	75	ALUM ADDITION NOW TO SUCTION SIDE OF RETURN SLUDGE PUMP B1												
24	10	75	ACCLIMATING PLANTS A (TSC*) AND B (TSS) TO SSRT 10 DAYS												
24	10	75	AND TEMP 25 C												
24	10	75	1	3	1.25	1.25	1.25	0.31	1.25					9	AL
24	10	75	1	3	1.25	1.25	1.25	0.31	1.25					9	AL
24	10	75	1	3	1.25	1.25	1.25	0.31	1.25	7.2	260			8	AL
24	10	75	1	3	1.25	1.25	1.25	0.31	1.25	7.3	952			9	AL
24	10	75	ALUM SPIKE STOPPED FOR TODAY ONLY												
24	10	75	1	3	1.25	1.25	1.25	0.31	1.25	7.3	236				
24	10	75	1	3	1.25	1.25	1.25	0.31	1.25	7.4	176			8	AL
24	10	75	1	3	1.25	1.25	1.25	0.31	1.25	7.4	132			8	AL
24	10	75	1	3	1.25	1.25	1.25	0.31	1.25					8	AL
24	10	75	1	3	1.25	1.25	1.25	0.31	1.25	7.3	112			8	AL
24	10	75	10 PLANT WITHOUT RAW SEWAGE FOR APPROXIMATELY 10 HRS												
24	10	75	1	3	1.25	1.25	1.25	0.31	1.25					176	
24	10	75	1	3	1.25	1.25	1.25	0.31	1.25	7.4	132	172		10	AL
24	10	75	1	3	1.25	1.25	1.25	0.31	1.25	7.2	112			8	AL
24	10	75	1	3	1.25	1.25	1.25	0.31	1.25	7.3			12	AL	
31	10	RAW SEWAGE OFF, PLANT DOWN FOR APPROXIMATELY 72 HRS.													

MODE OF OPERATION

DAY	MCN	YR	OPERATING MODE		FEED RATE		RETURN SLUDGE RATE		----RAW SEWAGE----				CHEMICAL ADDITION		
			A	B	A	B	A	B1	B2	PH	AM SS	PM SS	ALK	RATE	CHEM
31	10	75	1	3	1.25	1.25	1.25	0.31	1.25	8.0	176			12	AL
01	11	75	RAW SEWAGE INTERRUPTION, THEREFORE ALUM ADDITION OFF FOR 48 HRS												
01	11	75	1	3											
02	11	75	1	3											
03	11	75	1	3	1.25	1.25	1.25	0.31	1.25					9	AL
04	11	75	1	3	1.25	1.25	1.25	0.31	1.25					10	AL
05	11	75	1	3	1.25	1.25	1.25	0.31	1.25	7.3	72			11	AL
06	11	75	1	3	1.25	1.25	1.25	0.31	1.25		88			7	AL
07	11	75	1	3	1.25	1.25	1.25	0.31	1.25	7.3	108			7	AL
08	11	75	1	3	1.25	1.25	1.25	0.31	1.25					7	AL
09	11	75	1	3	1.25	1.25	1.25	0.31	1.25					8	AL
10	11	75	ACCLIMATION PLANTS A AND B COMPLETE, SSRT PLANT A AND B CALCULATIONS BASED FROM (10/11/75) TO (18/11/75)												
10	11	75	1	3	1.25	1.25	1.25	0.31	1.25	7.9	112			9	AL
11	11	75	1	3	1.25	1.25	1.25	0.31	1.25	7.4	88			9	AL
12	11	75	AMMONIA AND ALKALINITY SPIKE STARTED 1630 HRS TO TEMP. CONTROLLER FOR RATE DAY (13/11/75)												
12	11	75	1	3	1.25	1.25	1.25	0.31	1.25		1760			8	AL
13	11	75	1	3	1.25	1.25	1.25	0.31	1.25	7.6	1800	455		8	AL
14	11	75	1	3	1.25	1.25	1.25	0.31	1.25	7.6	100			8	AL
15	11	75	1	3	1.25	1.25	1.25	0.31	1.25					9	AL
16	11	75	1	3	1.25	1.25	1.25	0.31	1.25		101			9	AL
17	11	75	AMMONIA AND ALKALINITY SPIKE STARTED 1600 HRS TO TEMP. CONTROLLER FOR RATE DAY (18/11/75)												
17	11	75	1	3	1.25	1.25	1.25	0.31	1.25	7.2	128			9	AL
18	11	75	HEAVY SOLIDS IN RAW SEWAGE NOTED LATE IN AFTERNOON, TWO SETS OF COMPOSITE SAMPLES TAKEN, 15HR AND 24HR, THE 15HR COMPOSITE RESULTS WERE USED IN DATA ANALYSIS												
18	11	75	1	3	1.25	1.25	1.25	0.31	1.25		152	370	476	9	AL
18	11	75	NOTED IN RAW SEWAGE, PLANT DOWN, COOLER CLEANED, START UP 1100 HRS												
19	11	75	1	3	1.25	1.25	1.25	0.31	1.25					9	AL
20	11	75	ALUM SPIKE RESTARTED 0800 HRS, TEMPERATURE DECREASED TO 10 C, FOR ACC-												
20	11	75	1	3	1.25	1.25	1.25	0.31	1.25					9	AL
21	11	75	ACCLIMATING PLANTS A AND B (SSRT) TO SSRT 10 DAYS AND TEMP 5 C												
21	11	75	1	3	1.25	1.25	1.25	0.31	1.25					13	AL
22	11	75	1	3	1.25	1.25	1.25	0.31	1.25					13	AL
23	11	75	1	3	1.25	1.25	1.25	0.31	1.25					13	AL
24	11	75	1	3	1.25	1.25	1.25	0.31	1.25					8	AL
25	11	75	1	3	1.25	1.25	1.25	0.31	1.25					12	AL
26	11	75	1	3	1.25	1.25	1.25	0.31	1.25					7	AL
27	11	75	1	3	1.25	1.25	1.25	0.31	1.25	7.2	1120			10	AL
28	11	75	1	3	1.25	1.25	1.25	0.31	1.25	6.3	212			8	AL
29	11	75	1	3	1.25	1.25	1.25	0.31	1.25					8	AL
30	11	75	1	3	1.25	1.25	1.25	0.31	1.25					8	AL
01	12	75	1	3	1.25	1.25	1.25	0.31	1.25	7.5	148			9	AL
02	12	75	1	3	1.25	1.25	1.25	0.31	1.25	7.4	128			9	AL
02	12	75	ACCLIMATION PLANTS A AND B COMPLETE, SSRT PLANT A AND B CALCULATIONS BASED FROM (02/12/75) TO (09/12/75)												
03	12	75	AMMONIA SPIKE STARTED 1600 HRS TO TEMP. CONTROLLER FOR RATE DAY (04/12/75)												
03	12	75	1	3	1.25	1.25	1.25	0.31	1.25	7.3	128			9	AL
04	12	75	1	3	1.25	1.25	1.25	0.31	1.25	7.3	92	304	243	9	AL
05	12	75	1	3	1.25	1.25	1.25	0.31	1.25	7.2	392			10	AL
06	12	75	1	3	1.25	1.25	1.25	0.31	1.25	7.4		104		9	AL
07	12	75	1	3	1.25	1.25	1.25	0.31	1.25			44		9	AL
08	12	75	AMMONIA SPIKE STARTED 1600 HRS TO TEMP. CONTROLLER FOR RATE DAY (09/12/75)												
08	12	75	1	3	1.25	1.25	1.25	0.31	1.25	7.4	64			9	AL

MODE OF OPERATION

			OPERATING		FEED		RETURN SLUDGE		----RAW SEWAGE----				CHEMICAL			
DAY	MON	YR	MCDE	A B	A	RATE B	A	RATE B2	PH	AM	PH	SS	ALK	RATE	CHEM	
09	12	75	1	3	1.25	1.25	1.25	0.31	1.25	132	184	219		9	AL	
10	12	75	ALUM ADDITION NOW TO SUCTION SIDE OF RETURN SLUDGE PUMP												82	
10	12	75	ACCLIMATING PLANTS A(TSC*) AND B(TSC) TO SSRT 10 DAYS AND TEMP												5 C	
11	12	75	1	2	1.25	1.25	1.25	1.25	1.25					9	AL	
11	12	75	1	2	1.25	1.25	1.25	1.25	1.25					9	AL	
12	12	75	1	2	1.25	1.25	1.25	1.25	1.25					9	AL	
13	12	75	1	2	1.25	1.25	1.25	1.25	1.25					9	AL	
14	12	75	1	2	1.25	1.25	1.25	1.25	1.25					9	AL	
15	12	75	1	2	1.25	1.25	1.25	1.25	1.25					9	AL	
16	12	75	1	2	1.25	1.25	1.25	1.25	1.25	64				9	AL	
16	12	75	ACCLIMATION PLANT A COMPLETE. SSRT PLANT A CALCULATIONS BASED												144	
16	12	75	FROM (16/12/75) TO (23/12/75), PLANT B SSRT LESS THAN 8 DAYS.													
17	12	75	1	2	1.25	1.25	1.25	1.25	7.3	656				6	AL	
18	12	75	AMMONIA SPIKE STARTED 1600 HRS TO TEMP. CONTROLLER													
18	12	75	FOR RATE DAY (19/12/75)													
19	12	75	1	2	1.25	1.25	1.25	1.25	576					9	AL	
19	12	75	CANNOT USE SYSTEM 3 RESULTS. SOLIDS RETENTION TIME TO LOW, HOWEVER WE CAN													
19	12	75	USE SYSTEM 4 RESULTS FOR REPEAT													
20	12	75	1	2	1.25	1.25	1.25	1.25	8.6	124	208	202		9	AL	
21	12	75	1	2	1.25	1.25	1.25	1.25	7.3	80				8	AL	
21	12	75	1	2	1.25	1.25	1.25	1.25	7.3	80				8	AL	
22	12	75	AMMONIA SPIKE STARTED 1600 HRS TO TEMP. CONTROLLER													
22	12	75	FOR RATE DAY (23/12/75)													
22	12	75	1	2	1.25	1.25	1.25	1.25	7.5	104				8	AL	
23	12	75	ANALYTICAL AND OPERATING ERRORS, THEREFORE RATE DAY RESULTS													
23	12	75	QUESTIONABLE													
23	12	75	1	2	1.25	1.25	1.25	1.25	8.5	144	204	237		7	AL	
24	12	75	1	2	1.25	1.25	1.25	1.25		108				7	AL	
25	12	75	1	2	1.25	1.25	1.25	1.25						7	AL	
25	12	75	REDUCED ALUM PUMPING DUE TO PROBLEMS WITH CHEMICAL FEED PUMP													
26	12	75	1	2	1.25	1.25	1.25	1.25						1	AL	
26	12	75	AMMONIA SPIKE STARTED 1600 HRS TO TEMP. CONTROLLER													
26	12	75	FOR RATE DAY (27/12/75)													
27	12	75	ANALYTICAL AND OPERATING ERRORS, THEREFORE RATE DAY RESULTS													
27	12	75	QUESTIONABLE													
27	12	75	1	2	1.25	1.25	1.25	1.25	8.7	24		199		10	AL	
28	12	75	RE-ACCLIMATION PLANTS A(TSC*) AND B(TSC) TO SSRT 10 DAYS AND													
28	12	75	TEMP. 5 C													
28	12	75	1	2	1.25	1.25	1.25	1.25						4	AL	
29	12	75	1	2	1.25	1.25	1.25	1.25						4	AL	
30	12	75	1	2	1.25	1.25	1.25	1.25						4	AL	
31	12	75	1	2	1.25	1.25	1.25	1.25						4	AL	
01	01	76	1	2	1.25	1.25	1.25	1.25						4	AL	
02	01	76	1	2	1.25	1.25	1.25	1.25						4	AL	
03	01	76	1	2	1.25	1.25	1.25	1.25						4	AL	
04	01	76	ACCLIMATION PLANTS A AND B COMPLETE. SSRT PLANT A AND B													
04	01	76	CALCULATIONS BASED FROM (05/12/75) TO (08/12/75)													
05	01	76	1	2	1.25	1.25	1.25	1.25						5	AL	
05	01	76	AMMONIA SPIKE STARTED 1600 HRS TO TEMP. CONTROLLER													
05	01	76	FOR RATE DAY (06/01/76)													
06	01	76	1	2	1.25	1.25	1.25	1.25	7.3	56				5	AL	
06	01	76	AMMONIA SPIKE STARTED 1600 HRS TO TEMP. CONTROLLER													
06	01	76	FOR RATE DAY (07/01/76)													
07	01	76	1	2	1.25	1.25	1.25	1.25	7.3	80	176	225		5	AL	
07	01	76	1	2	1.25	1.25	1.25	1.25	6.7	52				5	AL	
08	01	76	1	2	1.25	1.25	1.25	1.25	7.9	84	232	236		5	AL	
09	01	76	CHANGE B SYSTEM FROM TSC* TO TSS. CHANGE CHEMICAL ADDITION FROM AL													
09	01	76	TO FE AND ADDITION TO SUCTION SIDE OF RETURN SLUDGE PUMP												81	
09	01	76	ACCLIMATING PLANTS A(TSC*) AND B(TSS) TO SSRT 10 DAYS AND TEMP 25 C													

MODE OF OPERATION

DAY	MON	YR	OPERATING		FEED		RETURN SLUDGE		----RAW SEWAGE----				CHEMICAL	
			A	B	A	B	A	B1 B2	PH	AM SS	PM SS	ALK	RATE	CHEM
09	01	76	1	3	1.25	1.25	1.25	0.31 1.25	7.1	792			17	FE
10	01	76	1	3	1.25	1.25	1.25	0.31 1.25					17	FE
11	01	76	1	3	1.25	1.25	1.25	0.31 1.25					17	FE
12	01	76	1	3	1.25	1.25	1.25	0.31 1.25					13	FE
13	01	76	1	3	1.25	1.25	1.25	0.31 1.25					14	FE
14	01	76	1	3	1.25	1.25	1.25	0.31 1.25		140			14	FE
15	01	76	1	3	1.25	1.25	1.25	0.31 1.25		83			15	FE
16	01	76	1	3	1.25	1.25	1.25	0.31 1.25	8.2	116			17	FE
17	01	76	1	3	1.25	1.25	1.25	0.31 1.25					17	FE
18	01	76	1	3	1.25	1.25	1.25	0.31 1.25					17	FE
18	01	76	ACCLIMATION PLANTS A AND B COMPLETE. SSRT PLANT A AND B											
19	01	76	CALCULATIONS BASED FROM (19/01/76) TO (21/01/76)											
20	01	76	AMMONIA AND ALKALINITY SPIKE STARTED 1400 HRS TO TEMP. CONTROLLER											
20	01	76	FOR RATE DAY(21/01/76)											
20	01	76	1	3	1.25	1.25	1.25	0.31 1.25	7.3	164			21	FE
21	01	76	1	3	1.25	1.25	1.25	0.31 1.25	7.5	128	284	483	21	FE
22	01	76	1	3	1.25	1.25	1.25	0.31 1.25		160	232		21	FE
22	01	76	AMMONIA AND ALKALINITY SPIKE STARTED 1600 HRS TO TEMP. CONTROLLER											
22	01	76	FOR RATE DAY(23/01/76)											
23	01	76	1	3	1.25	1.25	1.25	0.31 1.25	8.0	92		855	21	FE
24	01	76	RAW SEWAGE FOUND OFF IN MORNING, PLANT ON RECYCLE, THEREFORE											
24	01	76	RATE DAY 23/01/76 NOT VALID											
24	01	76	1	3	1.25	1.25	1.25	0.31 1.25					21	FE
25	01	76	1	3										
26	01	76	IN PREPARATION FOR NITRIFICATION VARIABILITY STUDY, PLANT B CHANGED											
26	01	76	FROM TSS TO TSC, CHEMICAL ADDITION STOPPED, TEMPERATURE LOWERED											
26	01	76	TO 5 C											
26	01	76	ACCLIMATING PLANT A(TSC) TO SSRT 15 DAYS AND TEMP 5 C, ACCLIMATING											
26	01	76	PLANT B(TSC) TO SSRT 10 DAYS AND TEMP 5 C											
27	01	76	1	1	1.0	0.75	1.25	1.25						
27	01	76	TEMPERATURE INCREASED FROM 5 C TO 15 C TO ALLOW FASTER ACCLIMATION											
27	01	76	RETURN SLUDGE RATE CHANGED A = 0.75 AND B = 1.0 IGAL/MIN											
28	01	76	1	1	1.0	0.75	0.75	1.0						
28	01	76	1	1	1.0	0.75	0.75	1.0						
29	01	76	1	1	1.0	0.75	0.75	1.0						
30	01	76	PLANT D (EXTENDED AERATION) OPERATING AT APPROXIMATE SSRT OF 15											
30	01	76	DAYS NOW BEING ACCLIMATED TO SSRT OF 10 DAYS UNDER AMBIENT TEMP											
30	01	76	CONDITIONS.											
30	01	76	OPERATING CONDITIONS OF PLANT D FROM (30/01/76) TO (25/02/76)											
30	01	76	FEED RATE OF 20 IGPM (132 M3/DAY)											
30	01	76	RETURN SLUDGE RATE APPROXIMATELY 20 IGPM (132 M3/DAY)											
30	01	76	PH, TEMP, DO, CONDITIONS SEE REACTOR OPERATING RESULTS SECTION											
30	01	76	1.0	0.75	1.0		128						0.75 1 1	
31	01	76	1	1	1.0	0.75	0.75	1.0						
01	02	76	TEMPERATURE DECREASED FROM 15 C TO APPROXIMATELY 5 C											
01	02	76	1	1	1.0	0.75	0.75	1.0						
02	02	76	1	1	1.0	0.75	0.75	1.0						
03	02	76	FEED AND RETURN SLUDGE RATE B SYSTEM CHANGED FROM 1.0 TO 0.75 IGAL/MIN											
03	02	76	1	1	0.75	0.75	0.75	0.75	7.8					
04	02	76	1	1	0.75	0.75	0.75	0.75	8.4	236				
05	02	76	RAKE IN CLARIFIER PLANT B FOUND OFF, CORRECTED											
05	02	76	1	1	0.75	0.75	0.75	0.75	7.5	212				
06	02	76	1	1	0.75	0.75	0.75	0.75	7.4					
07	02	76	1	1	0.75	0.75	0.75	0.75						
08	02	76	1	1	0.75	0.75	0.75	0.75	7.5	228				
09	02	76	ACCLIMATION PLANTS A, B AND D COMPLETE, SSRT PLANTS A, B AND D											
09	02	76	CALCULATIONS BASED FROM 10/02/76 TO 25/02/76											
09	02	76	NITRIFICATION VARIABILITY STUDY V1 10/02/76 TO 25/02/76											

MODE OF OPERATION

DAY	MON	YR	OPERATING MCODE A B	FEED RATE A B	RETURN SLUDGE RATE A B1 B2	----RAW SEWAGE----	CHEMICAL ADDITION RATE CHEM
						PH SS PM ALK	
09	02	76	1 1	0.75 0.75	0.75 0.75	7.5 283	
10	02	76	1 1	0.75 0.75	0.75 0.75	7.4 176	
11	02	76	1 1	0.75 0.75	0.75 0.75	7.3	
12	02	76	1 1	0.75 0.75	0.75 0.75	7.5	
13	02	76	1 1	0.75 0.75	0.75 0.75	7.4	156C
14	02	76	1 1	0.75 0.75	0.75 0.75		74C
15	02	76	1 1	0.75 0.75	0.75 0.75		100C
16	02	76	1 1	0.75 0.75	0.75 0.75	7.3	104C
17	02	76	1 1	0.75 0.75	0.75 0.75	7.5	70C
18	02	76	1 1	0.75 0.75	0.75 0.75	7.5	102C
19	02	76	1 1	0.75 0.75	0.75 0.75	7.5	56C
20	02	76	1 1	0.75 0.75	0.75 0.75	7.6	98C
21	02	76	1 1	0.75 0.75	0.75 0.75	7.6	64C
22	02	76	1 1	RAKE IN CLARIFIER	PLANT B FOUND OFF	CORRECTED	
22	02	76	1 1	0.75 0.75	0.75 0.75		66C
23	02	76	1 1	0.75 0.75	0.75 0.75	7.5	96C
24	02	76	1 1	SAMPLER ON EB	MISSED SAMPLES 1600 TO 0700 HRS	RESULTS BASED	
24	02	76	2 1	ON 7HR COMPOSITE			
25	02	76	2 1	0.75 0.75	0.75 0.75	7.5 100C	
26	02	76	2 1	0.75 0.75	0.75 0.75	7.4 78C	
26	02	76	2 1	CHANGED RETURN SLUDGE RATES AND FEED RATES BOTH A AND B TO 1.0 IGAL/MIN			
26	02	76	2 1	FERRIC CHLORIDE ADDITION TO PLANT A AT EFFLUENT END OF AERATION			
26	02	76	2 1	TANK IN PREPARATION FOR EXPERIMENT V2			
27	02	76	NNN 1	1.0 1.0	1.0 1.0	98	13 FE
27	02	76	NNN 1	1.0 1.0	1.0 1.0		17 FE
28	02	76	NNN 1	1.0 1.0	1.0 1.0		17 FE
29	02	76	NNN 1	1.0 1.0	1.0 1.0		17 FE
01	03	76	NNN 1	1.0 1.0	1.0 1.0	7.4 88	9 FE
02	03	76	NNN 1	1.0 1.0	1.0 1.0	8.2 52	14 FE
03	03	76	NNN 1	1.0 1.0	1.0 1.0	7.7 64	14 FE
04	03	76	NNN 1	1.0 1.0	1.0 1.0	7.4 84	24 FE
05	03	76	NNN 1	1.0 1.0	1.0 1.0	7.4 58	24 FE
06	03	76	NNN 1	1.0 1.0	1.0 1.0		24 FE
07	03	76	NNN 1	1.0 1.0	1.0 1.0		25 FE
08	03	76	NNN 1	1.0 1.0	1.0 1.0	7.3 20	18 FE
09	03	76	NNN 1	1.0 1.0	1.0 1.0	7.4 48	18 FE
10	03	76	NNN 1	1.0 1.0	1.0 1.0	7.4 46	20 FE
11	03	76	NNN 1	1.0 1.0	1.0 1.0	7.3 25	20 FE
12	03	76	NNN 1	INFLUENT FLOW CONTROLLED, PLANT A IN SINUSOIDAL FASHION AS PER			
12	03	76	NNN 1	FIGURE 21, (12/03/76) TO (22/04/76)			
13	03	76	NNN 1	1.0 1.0	1.0 1.0	7.5 70	16 FE
14	03	76	NNN 1	1.0 1.0	1.0 1.0		17 FE
15	03	76	NNN 1	1.0 1.0	1.0 1.0		17 FE
16	03	76	NNN 1	1.0 1.0	1.0 1.0	7.4 38	15 FE
17	03	76	NNN 1	1.0 1.0	1.0 1.0	7.7 187	17 FE
17	03	76	NNN 1	INFLUENT FLOW CONTROLLED, PLANT B IN SINUSOIDAL FASHION AS PER			
17	03	76	NNN 1	FIGURE 21, (17/03/76) TO (22/04/76)			
18	03	76	NNN 1	1.0 1.0	1.0 1.0	7.6 20	17 FE
19	03	76	NNN 1	1.0 1.0	1.0 1.0	7.4 44	17 FE
20	03	76	NNN 1	1.0 1.0	1.0 1.0		18 FE
21	03	76	NNN 1	1.0 1.0	1.0 1.0	7.4 70	18 FE
23	03	76	NNN 1	FERRIC CHLORIDE SPIKE STOPPED FOR APPROXIMATELY 6 HRS			
24	03	76	NNN 1	RAW SEWAGE OFF APPROXIMATELY 11 HRS			
24	03	76	NNN 1	1.0 1.0	1.0 1.0	7.6 122	13 FE
25	03	76	NNN 1	1.0 1.0	1.0 1.0	7.6 44 122	15 FE
25	03	76	NNN 1	1.0 1.0	1.0 1.0	7.5 85 188	15 FE
26	03	76	NNN 1	AUTOMATIC VALVE FAILURE, SLUDGE WASTED FROM PLANT A UNINTENTIONALLY			
26	03	76	NNN 1	1.0 1.0	1.0 1.0	167	15 FE
27	03	76	NNN 1	RE-ACCLIMATING PLANT A WITH FERRIC CHLORIDE ADDITION TO SSRT			

MODE OF OPERATION

DAY	MCN	YR	OPERATING MODE		FEED RATE	RETURN RATE	SLUDGE RATE		---RAW SEWAGE---				CHEMICAL ADDITION	
			A	B	A	B	A	B	PH	AM SS	PM SS	ALK	RATE	CHEM
27	03	76	OF 10 DAYS											
27	03	76	2	1			1.0	1.0					15	FE
28	03	76	2	1			1.0	1.0	7.5		46		15	FE
29	03	76	2	1			1.0	1.0					15	FE
30	03	76	2	1			1.0	1.0					15	FE
31	03	76	2	1			1.0	1.0			74		15	FE
01	04	76	2	1			1.0	1.0	7.6		48		15	FE
02	04	76	2	1			1.0	1.0	7.5		54		15	FE
03	04	76	2	1			1.0	1.0	7.5				15	FE
04	04	76	2	1			1.0	1.0					15	FE
05	04	76	2	1			1.0	1.0			54		15	FE
06	04	76	2	1			1.0	1.0	7.5		42		15	FE
07	04	76	ACCLIMATION PLANTS A AND B COMPLETE. SSRT PLANT A AND B CALCULATIONS											
07	04	76	BASED FROM (07/04/76) TO (22/04/76) NITRIFICATION VARIABILITY STUDY V2											
07	04	76	2	1			1.0	1.0	7.5	148	88	188	15	FE
08	04	76	NN	1			1.0	1.0	7.4	124	CC	188	15	FE
09	04	76	NN	1			1.0	1.0	8.1	104	CC	202	15	FE
10	04	76	NN	1			1.0	1.0	7.4	59	CC	172	16	FE
11	04	76	NN	1			1.0	1.0	7.4	56	CC	218	16	FE
12	04	76	NN	1			1.0	1.0	7.4	82	CC	224	16	FE
13	04	76	NN	1			1.0	1.0	7.5	74	CC	219	18	FE
14	04	76	NN	1			1.0	1.0	7.5	38	CC	244	18	FE
15	04	76	NN	1			1.0	1.0	7.4	74	CC	214	18	FE
16	04	76	NN	1			1.0	1.0	7.3	22	CC	202	16	FE
17	04	76	NN	1			1.0	1.0	7.3	16	CC	202	16	FE
18	04	76	NN	1			1.0	1.0	7.3	38	CC	234	16	FE
19	04	76	NN	1			1.0	1.0	7.4	1	CC	234	16	FE
20	04	76	NN	1			1.0	1.0	7.4	46	CC	233	16	FE
21	04	76	NN	1			1.0	1.0	7.4	46	CC	233	16	FE
22	04	76	NN	1			1.0	1.0	7.4	78	CC	282	16	FE
22	04	76	END OF STUDY											

STOP

REACTOR OPERATING RESULTS												
YEAR	DATE	MON	TIME	REACTOR	MLSS	MLVSS	WASTE	IGAL	WASTE	EFFLUENT	PH	REACTOR
	DAY						CONC			SS ALK		TEMP
												DO
												OUR
75	11	07	AM	A1	3210						7.5	21.6
75	14	07	AM	A1	4100						7.5	24.3
75	15	07	AM	A1	4740						7.4	24.3
75	16	07	AM	A1	5650						7.3	24.5
75	17	07	AM	A1	6320						7.3	24.5
75	18	07	AM	A1	5130						7.3	24.5
75	21	07	AM	A1	4900						7.5	25.3
75	21	01	AM	A2	4010	2710	8110	20	11		6.6	24.6
75	22	07	AM	A1	5160	3080					7.0	25.0
75	22	07	PM	A1	5040							
75	23	07	AM	A1	5190						6.8	25.4
75	24	07	AM	A1	4770	2950					6.7	25.4
75	24	07	PM	A1	5190							
75	25	07	AM	A1	4750							
75	29	07	PM	A1	4950							
75	30	07	AM	A1	6280	5330					7.2	24.8
75	31	07	AM	A1	5720						7.3	24.8
75	01	08	AM	A1	6250						7.2	24.8
75	05	08	AM	A1	4780						7.1	24.5
75	06	08	AM	A1	4620						7.1	24.5
75	07	08	AM	A1	4210						7.4	24.2
75	08	08	AM	A1	3800						7.4	24.5
75	09	08	AM	A1	4260						7.3	25.0
75	10	08	AM	A1	4190						7.1	25.5
75	11	08	AM	A1	4580						7.2	25.5
75	12	08	AM	A1	3590	2570					6.9	25.0
75	12	08	PM	A1	5100							
75	13	08	AM	A1	3790						6.9	25.0
75	14	08	AM	A1	4280						7.3	24.4
75	15	08	AM	A1	3350							
75	15	08	PM	A1	4280							
75	17	08	AM	A1	3110						6.9	25.5
75	18	08	AM	A1	2770	2110					7.0	25.0
75	18	08	AM	A1	2820							
75	19	08	AM	A1	3450						7.3	24.4
75	20	08	AM	A1	4200							
75	21	08	AM	A1	4350							
75	22	08	AM	A1	4530							
75	22	08	PM	A1	4130						7.3	25.0
75	23	08	AM	A1	4230							
75	24	08	AM	A1	4610							
75	25	08	AM	A1	5610						6.9	25.4
75	26	08	AM	A1	5790						7.1	25.7
75	27	08	AM	A1	6700						7.1	25.7
75	28	08	AM	A1	6490						7.1	25.0
75	29	08	AM	A1	6440						7.2	26.0
75	01	09	AM	A1	7330	4900						
75	01	09	PM	A1	6600						7.2	26.0
75	02	09	AM	A1	6830							
75	03	09	PM	A1	7030						7.2	26.3
75	04	09	AM	A1	6150							
75	08	09	AM	A1	6410						7.1	25.1
75	09	09	AM	A1	6320							
75	11	09	AM	A1	6630							
75	13	09	AM	A1	5830							
75	15	09	AM	A1	6310							
75	16	09	AM	A1	6390						7.2	24.5
75	17	09	AM	A1	6880						7.4	24.5
75	18	09	PM	A1	5650						7.2	25.3
75	19	09	AM	A1	5940						7.3	25.2
												5.1
												9.0

REACTOR OPERATING RESULTS

YEAR	DATE	MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR
75	20	09	AM	A1	5090								
75	21	09	AM	A1	5510								
75	22	09	AM	A1	7220	5220				7.3	6.0	9.9	4.8
75	22	09	PM	A1	5800	4120							
75	23	09	AM	A1	7150								
75	23	09	AM	A1	5260					7.4	3.8	5.8	
75	24	09	AM	A1	4550					7.4	3.4	5.0	
75	24	10	AM	A1	4450					7.4	3.0	5.3	
75	06	10	AM	A1	7330					7.4	3.0	5.3	
75	07	10	AM	A1	7600					7.4	3.0	5.3	
75	08	10	AM	A1	7700					7.4	3.0	5.3	
75	09	10	AM	A1	7410	4700				7.2	3.0	5.3	20.3
75	09	10	PM	A1	7410								
75	10	10	AM	A1	6980					7.1	3.0	5.3	
75	11	10	AM	A1	7150								
75	12	10	AM	A1	6770								
75	13	10	AM	A1	6500								
75	14	10	AM	A1	6550					7.0	2.3	3.8	
75	15	10	PM	A1	6550					7.0	2.3	3.8	
75	17	10	AM	A1	6280	3960				6.8	2.5	3.6	22.4
75	17	10	PM	A1	6080								
75	20	10	AM	A1	5510					7.3	2.5	6.1	
75	21	10	AM	A1	6090					7.3	2.5	5.7	
75	22	10	AM	A1	5610					7.3	2.5	5.8	
75	23	10	AM	A1	5780					7.3	2.5	5.6	
75	24	10	AM	A1	5420					7.2	2.5	5.5	
75	26	10	AM	A1	4580					7.3	2.4	5.8	
75	27	10	AM	A1	4400								
75	28	10	AM	A1	4420					7.3	2.5	5.7	
75	29	10	AM	A1	4440					7.2	2.5	5.2	
75	30	10	AM	A1	4420					7.2	2.5	5.3	
75	31	10	AM	A1	4090					7.3	2.5	5.3	
75	05	11	AM	A1	4750					7.2	2.5	5.0	
75	06	11	AM	A1	4670					7.1	2.5	5.0	
75	07	11	AM	A1	4740					7.1	2.5	5.3	
75	10	11	AM	A1	4380					7.2	2.5	5.1	
75	11	11	AM	A1	4410					7.3	2.5	5.3	
75	12	11	AM	A1	4570					7.2	2.5	5.0	
75	13	11	PM	A1	4790	3240				7.0	2.4	5.4	
75	13	11	AM	A1	4570								
75	14	11	AM	A1	4280					6.8	24.0	4.6	
75	15	11	AM	A1	4520								
75	16	11	AM	A1	3840								
75	17	11	AM	A1	3940					7.1	24.6	4.2	
75	18	11	AM	A1	3780	2720				6.7	25.0	2.0	27.8
75	18	11	PM	A1	3780								
75	19	11	AM	A1	8970								
75	27	11	AM	A1	4940					7.1	4.4	8.1	
75	28	11	AM	A1	4560					6.9	5.4	7.4	
75	01	12	AM	A1	4750					7.0	5.4	7.9	
75	02	12	AM	A1	4880					7.0	5.4	7.9	
75	03	12	AM	A1	5080					7.1	4.9	9.2	
75	04	12	AM	A1	5210	3710				7.3	4.5	10.6	1.3
75	04	12	PM	A1	5430								
75	05	12	AM	A1	5440					7.0	5.3	7.4	
75	06	12	AM	A1	5370					7.0	5.0	7.9	
75	07	12	AM	A1	5180								
75	08	12	AM	A1	5170					7.1	4.9	8.0	
75	09	12	AM	A1	5340	3810				7.2	4.8	8.3	3.9
75	09	12	PM	A1	5110								

REACTOR OPERATING RESULTS

YEAR	DATE DAY	MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR
75	15	12	AM	A1	4920								
75	16	12	PM	A1	4910								
75	17	12	AM	A1	5460					7.1	5.2	8.0	
75	18	12	AM	A1	5290	3750				7.2	4.7	7.8	
75	18	12	PM	A1	5000						4.7	7.6	
75	19	12	AM	A1	4800	3430				7.0	4.5	8.0	4.1
75	19	12	PM	A1	4880						4.7	7.4	
75	20	12	AM	A1	5130					7.0	5.0	7.4	
75	21	12	AM	A1	4880								
75	22	12	AM	A1	4860					7.0	5.1	7.6	
75	23	12	AM	A1	5010	3560				7.0	5.4	7.7	
75	23	12	PM	A1	4700						5.5	7.2	
75	24	12	AM	A1	4710								
75	26	12	PM	A1	4860								
75	27	12	AM	A1	4560	3420				7.0	5.3	7.4	
75	27	12	PM	A1	4460								
76	02	01	AM	A1							4.8	6.8	
76	04	01	AM	A1	4310								
76	05	01	AM	A1	4180					7.2	5.0	7.0	
76	06	01	AM	A1	4180	3210				7.0	4.7	6.5	6.4
76	06	01	PM	A1	4080						5.4	5.0	
76	07	01	AM	A1	4280					6.9	5.5	6.6	
76	08	01	AM	A1	4220	3230				7.1	5.2	5.9	5.3
76	08	01	PM	A1	4240								
76	09	01	AM	A1	5300					7.0	5.3	5.6	
76	13	01	AM	A1							21.0	5.9	
76	14	01	AM	A1	3290						21.5	5.9	
76	15	01	AM	A1	3190						23.5	5.8	
76	16	01	AM	A1	3270					7.4	24.5	5.6	
76	18	01	AM	A1	3580								
76	19	01	AM	A1	3720						23.5	6.6	
76	20	01	AM	A1	4180					7.4	24.0	5.3	
76	21	01	AM	A1	4300	2850				7.1	26.0	4.5	26.2
76	21	01	PM	A1	4070								
76	22	01	AM	A1	4000					6.9	24.5	5.5	
76	23	01	AM	A1	4040	2780				7.0	24.8	3.7	
76	23	01	PM	A1	4310						24.8	3.4	
76	24	01	AM	A1	3970								
76	30	01	AM	A1	3890						8.0	5.3	
76	02	02	AM	A1	5870					7.1	7.6	5.5	
76	03	02	AM	A1	6020					7.3	5.9	6.3	
76	04	02	AM	A1	6540					7.1	6.3	6.6	
76	05	02	AM	A1	6740					7.0	5.3	6.7	
76	06	02	AM	A1	6720					7.2	5.3	6.9	
76	08	02	AM	A1	6870					7.0	5.3	6.6	
76	09	02	AM	A1	6230	4460				7.3	5.1	5.4	
76	10	02	AM	A1	6800	4850				6.9	5.1	6.1	
76	11	02	AM	A1	6630					7.2	5.0	7.5	
76	12	02	AM	A1	6650					7.1	5.0	7.8	
76	13	02	AM	A1	6540					7.0	5.0	8.5	
76	14	02	AM	A1	6610	5046				7.1	4.9	7.5	
76	15	02	AM	A1	6540					7.2	4.9	7.2	
76	16	02	AM	A1	6470	4480				7.1	5.2	7.7	
76	17	02	AM	A1	6260					7.1	5.2	8.6	
76	18	02	AM	A1	6240	4270				7.0	5.0	8.8	
76	19	02	AM	A1	6120					7.0	5.0	8.8	
76	20	02	AM	A1	5900	4040				7.3	5.0	8.6	
76	21	02	AM	A1	5050	4190				7.0	5.0	8.6	
76	22	02	AM	A1	5600					7.0	5.0	8.8	
76	23	02	AM	A1	5640	3820				7.2	4.7	9.2	

REACTOR OPERATING RESULTS

DATE		MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR
YEAR	DAY												
76	24	02	AM	A1	5370					7.4	4.9	10.2	
76	25	02	AM	A1	5410	3690				7.3	5.1	9.7	
76	26	02	AM	A1	5110								
76	01	03	AM	A1	4150	2680				6.9	5.5	8.2	
76	02	03	AM	A1	3970	2530				7.1	5.2	8.3	
76	03	03	AM	A1	4090					7.1	5.1	8.4	
76	04	03	AM	A1	4420					7.1	5.1	8.4	
76	05	03	AM	A1	4460					7.1	5.1	8.3	
76	08	03	AM	A1	3920	2320				7.1	5.2	8.6	
76	09	03	AM	A1	4070					7.1	5.2	8.7	
76	10	03	AM	A1	4460	2580				7.2	5.0	8.9	
76	11	03	AM	A1	4140					7.1	4.9	8.2	
76	12	03	AM	A1	4240	2720				7.1	4.8	8.3	
76	15	03	AM	A1	4000	1513				7.1	5.0	8.7	
76	16	03	AM	A1	4450					7.2	5.1	8.9	
76	17	03	AM	A1	3960	2370				7.2	4.6	8.5	
76	18	03	AM	A1	4020					7.1	5.0	8.9	
76	19	03	AM	A1	4090	2460				7.0	5.0	8.9	
76	22	03	AM	A1	4170	2490				7.0	5.0	8.4	
76	23	03	AM	A1	4380					7.0	5.0	8.4	
76	23	03	PM	A1						7.2	5.5	8.4	
76	24	03	AM	A1	3720								
76	24	03	PM	A1	4030	2430				7.2	4.0	8.4	
76	24	03	PM	A1	4200					7.1	5.4	8.0	
76	25	03	AM	A1									
76	25	03	PM	A1	3960					7.1	4.0	8.6	
76	26	03	PM	A1	2480	1600							
76	26	03	AM	A1	3390								
76	27	03	AM	A1	3880						4.8		
76	29	03	AM	A1							4.7	8.8	
76	31	04	AM	A1	4460	2930				7.4	4.9	8.7	
76	01	04	AM	A1	4150					7.3	4.7	8.8	
76	02	04	AM	A1	4360	2780				7.2	11.4	6.6	
76	05	04	AM	A1	4200	2570				7.2	4.8	8.2	
76	06	04	AM	A1	4190					7.1	5.4	8.3	
76	07	04	AM	A1	4530	2820				7.2	4.8	8.8	
76	07	04	PM	A1	3880						4.8	6.4	
76	08	04	AM	A1	4480					7.0	5.4	7.3	
76	08	04	PM	A1	4410						4.8	5.1	
76	09	04	AM	A1	4520					7.0	5.4	5.9	
76	09	04	PM	A1	3760						5.0	7.9	
76	10	04	AM	A1	4480					7.1	6.0	9.8	
76	11	04	AM	A1	4320					7.0	5.0	9.0	
76	12	04	AM	A1	4360					7.0	5.5	8.8	
76	12	04	PM	A1	4050						5.0	7.9	
76	13	04	AM	A1	5330	3200				7.1	5.6	8.3	
76	13	04	PM	A1	3910						5.7	7.5	
76	14	04	AM	A1	4580	2790				7.2	4.8	8.8	
76	14	04	PM	A1	4140						4.8	7.9	
76	15	04	AM	A1	4770					6.9	5.5	8.0	
76	16	04	AM	A1	4870	2940				7.0	6.0	8.3	
76	17	04	AM	A1	4890					7.0	5.5	8.3	
76	18	04	AM	A1	4730					6.9	5.5	8.4	
76	18	04	AM	A1	4540								
76	19	04	AM	A1	5140	3130				7.1	5.5	8.2	
76	20	04	AM	A1	4500					7.0	5.6	7.8	
76	20	04	PM	A1	4180						4.6	6.9	
76	21	04	AM	A1	4720	2980				7.2	4.6	7.9	
76	21	04	PM	A1	4440								
76	22	04	AM	A1	4770					6.9	5.9	7.6	
76	22	04	PM	A1	4540								
76	23	04	AM	A1	4570	2810							

REACTOR OPERATING RESULTS

YEAR	DATE DAY	MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR	
75	11	07	AM	A2	3220				19	7.5	21.2	7.0		
75	14	07	AM	A2	3860				24	7.5	24.2	6.6		
75	15	07	AM	A2	4560		8730	13	39	7.5	24.0	5.3		
75	16	07	AM	A2	4740		11870	15	26	7.4	24.0	6.4		
75	17	07	AM	A2	5230		10370	20	28	7.4	24.0	6.1		
75	18	07	AM	A2	5200		10740	17	27	7.4	25.0	5.1		
75	20	07	AM	A2				18						
75	21	07	AM	A2	5220		11090	18	40	7.5	24.7	4.9		
75	22	07	AM	A2	4970	2950	10630	18	29	6.5	24.9	3.0	18.0	
75	23	07	PM	A2	4980				32					
75	23	07	AM	A2	4930		10940	18	15	21	6.3	24.9	5.1	
75	24	07	AM	A2	4560	2850	11000	18	16	11	6.1	24.8	5.2	15.0
75	24	07	PM	A2	4440				27			24.4	4.3	
75	25	07	PM	A2	4670				29					
75	30	07	PM	A2	35180	4920			17		7.3	24.0	5.0	
75	31	07	AM	A2	3580				16		7.4	24.4	6.0	
75	01	08	AM	A2	5710			12	25		7.3	24.5	6.3	
75	02	08	AM	A2				28			7.2	24.6	6.2	
75	03	08	AM	A2				18						
75	04	08	AM	A2				18						
75	05	08	AM	A2				18						
75	06	08	AM	A2	4430		9710	3	31	7.2	24.0	6.8		
75	06	08	AM	A2	4320		10300	3	23	7.2	23.5	7.3		
75	07	08	PM	A2			8210	15						
75	08	08	AM	A2	4380		5410	15	19	7.4	23.6	6.7		
75	09	08	AM	A2	3710			10	16	7.6	23.6	7.1		
75	09	08	AM	A2	3830		8330	10	16	7.3	24.6	4.9		
75	10	08	AM	A2	4010		7860	12	19	7.3	25.0	5.4		
75	11	08	AM	A2	3720		9000	30	13	7.4	25.3	5.7		
75	12	08	PM	A2			6020	12						
75	12	08	AM	A2	3650	2590	9480	18	14	8	6.5	25.0	2.2	
75	13	08	PM	A2	4080				24					
75	13	08	AM	A2	3920		8940	18	15		6.5	24.2	6.1	
75	14	08	PM	A2			4030	20						
75	14	08	AM	A2	3350		10570	17	17	7.5	23.8	7.3		
75	15	08	AM	A2	3390		7950	34	10	7.4	23.8	6.6		
75	16	08	AM	A2	3330				12					
75	17	08	AM	A2	2240		6840	33	13					
75	18	08	AM	A2	2950		5960	33	8	7.0	24.6	5.0		
75	18	08	AM	A2	2850	2120	8890	6	11	62	6.4	24.8	2.4	
75	19	08	AM	A2	2960				11					
75	20	08	AM	A2	3180				27		7.4	24.0	7.0	
75	21	08	AM	A2	3570			15			6.5			
75	22	08	AM	A2	3850		8430	15	108		5.8	12.0		
75	23	08	PM	A2	3760				72		7.2	5.5	8.1	
75	23	08	AM	A2	4010			3	54					
75	24	08	AM	A2	4260				62					
75	25	08	AM	A2	5580		17150	9	42					
75	26	08	AM	A2	5570		14970	11	36	6.9	5.8	6.5		
75	27	08	AM	A2	5710		13760	13	40	7.2	6.0	8.5		
75	28	08	AM	A2	6010		14200	16	34	7.2	6.0	8.3		
75	28	08	AM	A2			6010	5	31	7.2	5.8	8.0		
75	29	08	PM	A2				17						
75	29	08	AM	A2	6120		14740	17	18	7.2	6.5	8.0		
75	30	08	PM	A2			6120	4						
75	30	08	AM	A2				42						
75	01	09	AM	A2	6030	4080	13570	17	11	208	7.2	7.0	8.5	6.1
75	01	09	PM	A2	5820		15170	15	15		7.2			
75	02	09	AM	A2	6250		14010	17	13		7.2	6.9	8.1	

REACTOR OPERATING RESULTS

YEAR	DATE	MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR	
75	03	09	AM	A2			13660	17	11 228	7.3	5.4	8.8	3.2	
75	03	09	AM	A2			12510	10						
75	03	09	PM	A2	6020				9		5.5	8.5		
75	04	09	AM	A2	5650		15770	17	12		5.5	9.0		
75	08	09	AM	A2	5940			18	10	7.1				
75	09	09	AM	A2	6090			10	8					
75	10	09	AM	A2				37						
75	11	09	AM	A2	6740		14930	20	5		5.4	8.0		
75	11	09	AM	A2				28						
75	12	09	AM	A2				24						
75	13	09	AM	A2	5690			24	19					
75	14	09	AM	A2					24					
75	15	09	AM	A2	5960		13330	24	11	7.2	5.0	9.4		
75	16	09	AM	A2	5930		14020	52	12	7.4	5.0	8.0		
75	17	09	AM	A2	5580		10800	31	11	7.2	5.6	7.9		
75	18	09	AM	A2			9410	31	9				3.2	
75	18	09	PM	A2	5380				17	178	7.2	5.5	7.5	
75	19	09	AM	A2	5190		8090	31	17		5.5	8.9		
75	20	09	AM	A2				18						
75	20	09	AM	A2	5030				4					
75	21	09	AM	A2				16						
75	21	09	AM	A2	5460				31					
75	22	09	AM	A2			7430	31	13					
75	22	09	PM	A2	5510	3930			51	234	7.3	6.1	7.4	3.8
75	23	09	AM	A2	5840				13					
75	29	09	AM	A2	4730			11	20	7.3	24.0	6.9		
75	30	09	AM	A2	4680		9760	21	19	7.2	23.5	7.1		
75	01	10	AM	A2				22						
75	02	10	AM	A2	4200		9660	22	23	7.5	23.3	6.6		
75	03	10	AM	A2				17						
75	04	10	AM	A2				15						
75	05	10	AM	A2				15						
75	06	10	AM	A2	7170		14870	18	16	7.5	23.9	6.4		
75	07	10	AM	A2	7000		15190	21	17	7.4	23.7	6.7		
75	08	10	AM	A2	7390		15210	21	24	7.5	23.7	5.3		
75	09	10	AM	A2	7200	4620	15890	21	21	6.9	24.1	5.7	4.5	
75	09	10	PM	A2	6950				27	48	6.9	24.1	4.9	
75	10	10	AM	A2	7340		14800	21	31	7.3	24.3	7.4		
75	11	10	AM	A2	7390		14120	21	47					
75	12	10	AM	A2	6820		13880	21	66					
75	13	10	AM	A2	6100		13900	21	66					
75	14	10	AM	A2	6560			5		7.2	22.0	5.7		
75	15	10	AM	A2										
75	15	10	PM	A2	6680		13600	18	29	7.1	24.0	6.3		
75	17	10	AM	A2	6010	3810	12870	24	28	6.3	24.0	3.2	12.2	
75	17	10	PM	A2	5830				36	14				
75	18	10	AM	A2				24						
75	20	10	AM	A2				24						
75	21	10	AM	A2	5290		10830	24	90	7.4	24.0	6.9		
75	21	10	AM	A2	5530		11680	24	33	7.4	24.0	7.1		
75	22	10	AM	A2	5360		11290	20	32	7.4	23.5	6.9		
75	23	10	AM	A2	5220		11580	10	25	7.4	23.8	6.8		
75	24	10	AM	A2	5060		11800	19	22	7.3	24.0	6.8		
75	25	10	AM	A2				10						
75	26	10	AM	A2	4390		8730	10	30	7.5	24.0	6.9		
75	27	10	AM	A2	4190			0	35					
75	28	10	AM	A2	4270		8040	10	25	7.4	23.8	6.8		
75	29	10	AM	A2	4100		9510	10	23	7.4	24.0	6.9		
75	30	10	AM	A2	4190		9340	5	25	7.3	23.5	7.1		
75	30	10	AM	A2			8580							
75	31	10	AM	A2	3970		8790	9	14	7.4	23.5	7.1		

REACTOR OPERATING RESULTS

YEAR	DATE	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR
DAY	MON											
75	04	11	AM	A2			19					
75	05	11	AM	A2	4450	11170	19	4	7.2	24.0	6.6	
75	06	11	AM	A2	4650	10630	19	15	7.2	24.0	6.2	
75	07	11	AM	A2	4650	10940	19	27	7.2	24.0	6.0	
75	08	11	AM	A2			19					
75	09	11	AM	A2			19					
75	10	11	AM	A2	4340	9990	18	10	7.2	24.4	5.9	
75	11	11	AM	A2	4280	9170	18	18	7.3	24.1	5.7	
75	12	11	AM	A2	4140	8960	18	20	7.3	24.0	5.0	
75	13	11	AM	A2	4380	9330	18	28	6.5	23.7	4.1	
75	13	11	PM	A2	4200			14				
75	14	11	AM	A2	4400	8600	18	34	6.6	23.0	6.9	
75	15	11	AM	A2	4590	9290	18	45				
75	16	11	AM	A2	3830	7340	18	28				
75	16	11	PM	A2		8070	5					
75	17	11	AM	A2	3720	8790	18	31	7.2	23.5	5.3	
75	18	11	AM	A2	3900	7640	18	21	6.4	24.2	5.0	10.0
75	18	11	PM	A2	3570			25				
75	19	11	AM	A2	7070							
75	24	11	AM	A2			18					
75	25	11	AM	A2			24					
75	26	11	AM	A2			33					
75	27	11	AM	A2	4810	8960	68	76	7.2	4.6	9.0	
75	28	11	AM	A2	4600	9500	23	34	7.1	5.8	8.5	
75	29	11	AM	A2			23					
75	30	11	AM	A2			23					
75	01	12	AM	A2	4690	10710	23	16	7.1	5.7	9.0	
75	02	12	AM	A2	4740	11190	18	18	7.0	5.3	8.5	
75	03	12	AM	A2	4740	10380	18	17	7.2	5.5	10.2	
75	04	12	AM	A2	5030	10530	18	27	7.2	5.5	8.9	2.7
75	04	12	PM	A2	5530			25				
75	05	12	AM	A2	5330	13980	18	8	7.1	5.5	8.4	
75	05	12	PM	A2		10770	10					
75	06	12	AM	A2	5070	11070	18	10	7.0	5.4	9.2	
75	07	12	AM	A2	4910	10940	18	3				
75	08	12	AM	A2	5220	10060	18	15	7.1	5.4	9.0	
75	09	12	AM	A2	4910	11610	23	12	7.1	5.4	9.2	2.8
75	09	12	PM	A2	5060			23	161			
75	10	12	AM	A2			18					
75	11	12	AM	A2			18					
75	12	12	AM	A2			18					
75	13	12	AM	A2			18					
75	14	12	AM	A2			18					
75	15	12	AM	A2	4710	9600	20	24				
75	16	12	PM	A2	4830	9800	20	22				
75	17	12	AM	A2	5170	10650	30	20	7.1	5.5	8.5	
75	18	12	AM	A2	5120	10080	20	20	7.1	5.0	8.7	
75	18	12	PM	A2	5010			20				
75	19	12	AM	A2	5160	8580	20	28	7.1	4.5	8.9	3.1
75	19	12	PM	A2	4840			30				
75	20	12	AM	A2	4880	8960	20	39	7.2	5.5	8.2	
75	21	12	AM	A2	4630	7760	20	34	7.0	5.4	8.2	
75	22	12	AM	A2	4840	9280	20	36	7.0	5.6	8.1	
75	23	12	PM	A2	4630			29	151			
75	24	12	AM	A2	4720	8260	20	27				
75	25	12	AM	A2			20					
75	26	12	PM	A2	4690	8880	20	14				
75	27	12	AM	A2	4610	8590	20	25	112	6.9	5.5	7.3
75	27	12	PM	A2	4330		22					

REACTOR OPERATING RESULTS

YEAR	DATE	MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS	ALK	PH	REACTOR TEMP	DO	OUR
75	28	12	AM	A2				20						
75	29	12	AM	A2				20						
75	30	12	AM	A2				20						
75	31	12	AM	A2				20						
76	01	01	AM	A2				20						
76	02	01	AM	A2				20				4.9	7.4	
76	03	01	AM	A2				20						
76	04	01	AM	A2	4150		7700	20	5					
76	05	01	AM	A2	4130		7260	25	9		7.2	5.1	7.6	
76	06	01	AM	A2	4250	3300	8185	20	23	151	7.0	5.1	6.7	5.1
76	06	01	PM	A2	4110				25			5.4	6.3	
76	07	01	AM	A2	4160		8670	20	36		7.0	5.7	6.8	
76	08	01	AM	A2	4380	3350	8970	20	44	165	7.1	5.4	6.9	4.7
76	08	01	PM	A2	4220				46					
76	09	01	AM	A2	5050				60		7.0	5.5	6.9	
76	10	01	AM	A2				20						
76	11	01	AM	A2				20						
76	12	01	AM	A2				20						
76	13	01	AM	A2				20				20.8	5.7	
76	14	01	AM	A2	3380		5620	20	42			21.2	5.7	
76	15	01	AM	A2	2870		6000	10	14			22.8	5.3	
76	16	01	AM	A2	3080		6550	20	18		7.3	23.8	5.3	
76	18	01	AM	A2	3490		7190	20	19					
76	17	01	AM	A2				20						
76	20	01	AM	A2	4030		8160	20	39		7.3	25.0	5.2	
76	21	01	PM	A2	3870				23					
76	22	01	AM	A2	3930		8160	20	23		6.5	23.8	6.2	
76	23	01	AM	A2	3990	2740	8140	20	18	12	6.2	23.8	4.3	
76	23	01	PM	A2	4160							24.0	4.1	
76	24	01	AM	A2	3990									
76	30	01	AM	A2	3850									
76	31	01	AM	A2			8230	20	21			8.0	7.6	
76	01	02	AM	A2				10						
76	02	02	AM	A2				15						
76	03	02	AM	A2	5790		12910		6		7.2	8.4	8.0	
76	04	02	AM	A2	5820		13460	10	10		7.4	8.6	8.0	
76	05	02	AM	A2	6570		13380	15	17		7.3	8.8	9.0	
76	06	02	AM	A2	6590		14040	15	11		7.3	8.2	9.0	
76	07	02	AM	A2	6190		14100	15	19		7.4	8.6	9.0	
76	08	02	AM	A2				15						
76	09	02	AM	A2	6840		14040	15	13		7.1	6.0	8.5	
76	10	02	AM	A2	6110	4370	14330	15	6		7.4	5.9	8.9	
76	11	02	AM	A2	6530	4720	15020	15	10		7.2	5.8	8.4	
76	12	02	AM	A2	6770		14650	15	9		7.3	5.6	9.1	
76	13	02	AM	A2	6660		15150	15	11		7.3	5.6	9.3	
76	14	02	AM	A2	6680		14350	15	11		7.1	6.0	8.8	
76	15	02	AM	A2	6340	4440	13890	15	9		7.3	5.5	9.3	
76	16	02	AM	A2	6480		13810	10	9		7.3	5.0	4.5	
76	17	02	AM	A2	6320	4380	15120	15	8		7.3	5.8	9.8	
76	18	02	AM	A2	6100		14770	15	12		7.4	5.4	10.3	
76	19	02	AM	A2	6230	4310	13770	10	12		7.3	5.7	10.2	
76	20	02	AM	A2	6270		12700	15	13		7.2	5.6	10.8	
76	21	02	AM	A2	5980	4180	12420	10	15		7.4	5.6	10.4	
76	22	02	AM	A2	5970	4080	13130	15	13		7.4	5.5	9.6	
76	23	02	AM	A2	5770		11960	10	13		7.4	5.4	10.0	
76	24	02	AM	A2	5570	3820	12200	15	13		7.4	5.2	10.6	
76	25	02	AM	A2	5470		11550	11	24		7.3	5.4	11.1	
76	26	02	AM	A2	5450	3670	11810	13	24		7.4	5.6	10.4	
76	27	02	AM	A2	5220		10090	19	19					
76	28	02	AM	A2				4.8						

REACTOR OPERATING RESULTS

YEAR	DATE	MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR
76	29	02	AM	A2	4020	2540	8720	48	8	6.9	6.0	10.6	
76	01	03	AM	A2	4050	2600	8060	24	10	7.1	5.9	9.9	
76	02	03	AM	A2	4040		8050	24	11	7.1	5.9	9.9	
76	03	03	AM	A2	4280		8610	24	13	7.1	5.9	9.9	
76	04	03	AM	A2	4900		8640	30	11	7.1	5.9	9.9	
76	05	03	AM	A2	3970	2310	12710	18	13	7.1	5.9	9.9	
76	06	03	AM	A2	4150		8290	18	13	6.9	5.9	9.9	
76	07	03	AM	A2	4280	2460	9060	18	14	7.1	5.9	9.9	
76	08	03	AM	A2	4100		8320	18	13	7.1	5.9	9.9	
76	09	03	AM	A2	4280	2600	8440	18	11	7.1	5.9	9.9	
76	10	03	AM	A2	4080	1556	8130	18	11	7.1	5.9	9.9	
76	11	03	AM	A2	4300		8340	18	11	7.1	5.9	9.9	
76	12	03	AM	A2	4050	2430	7840	24	11	7.1	5.9	9.9	
76	13	03	AM	A2	3960		8020	18	11	7.1	5.9	9.9	
76	14	03	AM	A2	3970	2370	8090	18	11	7.1	5.9	9.9	
76	15	03	AM	A2	4280	2500	8100	24	11	7.1	5.9	9.9	
76	16	03	PM	A2	4370		9220	18	11	7.1	5.9	9.9	
76	17	03	PM	A2	3810		8200	15	15	7.3	5.9	9.9	
76	18	03	PM	A2	3810		8200	15	15	7.3	5.9	9.9	
76	19	03	PM	A2	3880	2150	8330	20	13	7.3	5.9	9.9	
76	20	03	PM	A2	4100		8330	20	20	7.3	5.9	9.9	
76	21	03	PM	A2	2280	1480			8	5.9	5.9	9.9	
76	22	03	PM	A2	4010		5760		8	5.9	5.9	9.9	
76	23	03	PM	A2	4210	2960	7850	32	17	7.4	5.9	9.9	
76	24	03	PM	A2	4420		8050	32	14	7.3	5.9	9.9	
76	25	03	PM	A2	4480	2840	8580	32	14	7.2	5.9	9.9	
76	26	03	PM	A2	4380	2630	7780	32	15	7.2	5.9	9.9	
76	27	03	PM	A2	4780		7490	23	10	7.1	5.9	9.9	
76	28	03	PM	A2	4450	2750	8190	26	14	7.1	5.9	9.9	
76	29	03	PM	A2	4130				13	112	7.1	5.9	9.9
76	30	03	PM	A2	4380		8130	34	13	103	7.0	6.0	8.5
76	31	03	PM	A2	4160				C 9				
76	01	04	PM	A2	4440		8460	22	10	120	6.9	5.4	7.5
76	02	04	PM	A2	4210				C 17				
76	03	04	PM	A2	4360		7660	27	19	110	7.0	5.0	9.3
76	04	04	PM	A2	4370		7980	22	C 6				
76	05	04	PM	A2					20	118	7.0	5.5	9.0
76	06	04	PM	A2	4320		7510	21	C 15				
76	07	04	PM	A2	4100				16	138	6.9	5.8	9.0
76	08	04	PM	A2	4800	2950	4880	24	C 14	122	7.0	5.0	9.2
76	09	04	PM	A2	4060				5	140	7.1	5.9	9.0
76	10	04	PM	A2	4850	3000	8020	23	C 5				
76	11	04	PM	A2	4560				8	122	6.8	5.1	8.7
76	12	04	PM	A2	4550		8410	23	C 9	116	6.9	5.4	8.9
76	13	04	PM	A2	5230	3250	8580	23	C 10	104	6.9	5.9	9.2
76	14	04	PM	A2	4630		8620	23	C 13	126	6.8	5.9	9.6
76	15	04	PM	A2	5220	3210	7820	23	C 13	134	7.0	5.9	9.4
76	16	04	PM	A2	4740		8370	24	C 31	146	6.9	5.4	9.0
76	17	04	PM	A2	4290				12	147	7.2	5.5	9.0
76	18	04	PM	A2	4620	2810	8140	23	C 12				
76	19	04	PM	A2	4500				7	127	6.9	6.2	8.4
76	20	04	PM	A2	5280		8520	22	C 7				

REACTOR OPERATING RESULTS

YEAR	DATE	MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR
76	22	04	PM	A2	4450								
76	23	04	AM	A2	4730	2920	7500	22					
75	11	07	AM	B1	3300					7.4	21.9	5.4	
75	14	07	AM	B1	4210					7.4	21.2	5.1	
75	15	07	AM	B1	5010					7.3	20.2	4.8	
75	15	07	AM	B1	6030					7.3	20.2	4.8	
75	17	07	AM	B1	6620					7.3	20.2	4.8	
75	18	07	AM	B1	6130					7.3	20.2	4.8	
75	21	07	AM	B1	5520					7.4	20.3	4.2	
75	22	07	AM	B1	5540	3180				7.0	20.3	4.2	20.5
75	22	07	PM	B1	5590								
75	23	07	AM	B1	5490					6.8	20.6	1.9	
75	24	07	AM	B1	5490					6.6	20.4	1.7	33.4
75	24	07	PM	B1	5320	3170							
75	25	07	AM	B1	5270								
75	25	07	AM	B1	5340								
75	27	07	AM	B1				32					
75	28	07	AM	B1				32					
75	28	07	AM	B1				32					
75	29	07	PM	B1	1550		7580	51	36	7.6	20.4	3.2	
75	30	07	AM	B1	1320		8230	54	13	7.6	20.3	7.1	
75	31	07	AM	B1	1600		9040	57	19	7.3	20.7	7.1	
75	01	08	AM	B1	1370			72	11	7.5	20.5	7.1	
75	02	08	AM	B1	900			62					
75	03	08	AM	B1				54					
75	04	08	AM	B1				46					
75	05	08	AM	B1	520		3630	54	21	7.4	24.8	7.2	
75	05	08	PM	B1	720								
75	06	08	AM	B1	710		4410	54	10	7.3	24.9	6.8	
75	06	08	PM	B1	710								
75	07	08	AM	B1	730		5610	54	17	7.8	24.7	7.6	
75	08	08	AM	B1	800		6890	54	14	7.7	20.2	6.2	
75	09	08	AM	B1	850		13560	5	22	7.6	20.6	5.8	
75	09	08	AM	B1			5000	54					
75	10	08	AM	B1	680		3010	54	25	7.8	20.5	6.5	
75	11	08	AM	B1	620		4820	17	16	7.9	20.4	3.5	
75	12	08	AM	B1	960	760	8870	50	22	7.9	20.2	6.2	
75	12	08	PM	B1	950		6700	13	21				
75	13	08	AM	B1	930		11940	52	9	8.0	20.7	5.8	
75	13	08	PM	B1	850		12540	10					
75	14	08	AM	B1	870		7860	52	21	7.6	20.2	6.2	
75	14	08	PM	B1			10730	7					
75	15	08	AM	B1	1320		9600	50	17	7.5	24.2	7.1	
75	15	08	AM	B1			12520	12					
75	15	08	PM	B1	720				38			1.6	
75	16	08	AM	B1	3180						20.4	4.8	
75	16	08	AM	B1	1560		8600	60	20		20.8	5.8	
75	17	08	AM	B1	770		3390	54	30	7.6	20.0	6.8	
75	18	08	AM	B1	820	620	8050	54	22	7.9	20.3	6.3	
75	18	08	AM	B1	780				21			6.2	
75	19	08	AM	B1	1140		18150		18	7.9	24.8	6.6	
75	19	08	AM	B1				9					
75	20	08	AM	B1	1270			54			5.2		
75	21	08	AM	B1	970			54			5.0	12.4	
75	21	08	AM	B1	840			58	36	7.2	4.6	10.2	
75	22	08	PM	B1	69								
75	23	08	AM	B1	1000			59					
75	24	08	AM	B1	1130			58					
75	25	08	AM	B1	1310		9130	40	29	7.0	4.8	9.8	
75	25	08	AM	B1			5000	70					
75	26	08	AM	B1	660		4460	74	46	7.5	5.2	11.5	

REACTOR OPERATING RESULTS

YEAR	DATE	MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	ICAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR
75	27	08	AM	B1	1100		5310	74	30	7.5	5.2	11.7	
75	28	08	AM	B1	1040		5560	64	68	7.5	4.8	12.0	
75	29	08	AM	B1	1010		4590	54	40	7.4	5.3	11.7	
75	30	08	AM	B1				54					
75	01	09	AM	B1	1720	1060	9090	54	55	7.4	6.2	10.9	7.5
75	01	09	PM	B1	1490		7510		55	7.4	5.9	10.6	
75	02	09	AM	B1	1520		5500	54	40	7.5	4.3	11.8	3.9
75	03	09	AM	B1				30	80	7.5	4.4	12.0	
75	03	09	PM	B1	1120				34		4.7	11.6	
75	04	09	AM	B1	1430					7.3			
75	08	09	AM	B1	4320								
75	09	09	AM	B1	4440								
75	11	09	AM	B1	5520						5.3	9.9	
75	13	09	AM	B1	5600								
75	15	09	AM	B1	5920					7.2	4.5	9.5	
75	16	09	AM	B1	5880					7.1	4.7	8.4	
75	17	09	AM	B1	5500					7.0	5.5	9.0	
75	18	09	PM	B1	5520					7.1	5.5	8.3	4.1
75	19	09	AM	B1	5600						5.4	8.4	
75	20	09	AM	B1	5910								
75	21	09	PM	B1	5990	3580				7.2	5.6	8.7	3.3
75	22	09	AM	B1	6700								
75	23	09	AM	B1	4920					7.2	25.7	5.6	
75	24	09	AM	B1	5480					7.3	25.2	4.9	
75	25	09	AM	B1	5590					7.3	25.8	3.6	
75	26	10	AM	B1	9040					7.3	25.6	3.7	
75	27	10	AM	B1	8130					7.2	25.1	3.9	
75	28	10	AM	B1	8190					7.3	25.3	3.7	
75	29	10	AM	B1	8310	5160				6.9	25.9	3.5	19.4
75	29	10	PM	B1	8040					25	24.9	3.6	
75	30	10	AM	B1	8140					6.9	26.1	3.5	
75	31	10	AM	B1	8420								
75	01	10	AM	B1	7530								
75	02	10	AM	B1	7300								
75	03	10	AM	B1	7830					6.8	24.0	2.5	
75	04	10	PM	B1	7140					6.8	25.5	2.6	
75	05	10	AM	B1	7870	4080				6.7	25.5	2.4	24.9
75	06	10	PM	B1	6890								
75	07	10	AM	B1				54					
75	08	10	AM	B1				54					
75	09	10	AM	B1				50	49	7.2	25.0	6.8	
75	10	10	AM	B1	1809		10690	44	26	7.3	26.9	5.6	
75	11	10	AM	B1	2570		13320	66	20	7.3	26.1	6.0	
75	12	10	AM	B1	1810		8150	59	16	7.6	26.1	6.9	
75	13	10	AM	B1	880		5720	59	11	7.4	26.0	6.4	
75	14	10	AM	B1	1170		7470						
75	15	10	AM	B1				59					
75	16	10	AM	B1	650		3500	59	21	7.6	26.0	7.1	
75	17	10	AM	B1	1110			31	27				
75	18	10	AM	B1	1240		10410	18	22	7.5	26.1	6.4	
75	19	10	AM	B2	2350				102	7.5	24.0	7.0	
75	20	10	AM	B1			2760	71					
75	21	10	PM	B1	500				42				
75	22	10	AM	B1	680		5370	73	39	7.7	26.4	6.8	
75	23	10	AM	B1			9540	14					
75	24	10	PM	B1	440								
75	25	10	AM	B1	710		2490	73	37	7.6	26.3	7.1	
75	26	10	PM	B1	480				22				
75	27	10	AM	B1	890		3700	90		7.6	26.0	6.5	
75	28	10	AM	B1			8370	22					

REACTOR OPERATING RESULTS

DATE YEAR DAY MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR
75	03	11	AM	91		81					
75	04	11	AM	81		78					
75	05	11	AM	81	570	5010	63	10	7.3	26.1	5.4
75	06	11	AM	91	860	6540	55	13	7.4	26.0	5.1
75	06	11	AM	81		10770	11				
75	07	11	AM	81	830	5400	64	16	7.3	26.3	4.8
75	08	11	AM	81			60				
75	09	11	AM	81			66				
75	10	11	AM	81	860	5620	55	7	7.4	26.3	4.7
75	10	11	PM	81		14610	9				
75	11	11	AM	81	680	4796	52	15	7.5	26.4	5.1
75	11	11	AM	81		13870	8				
75	12	11	AM	81	540	4620	53	18	7.4	26.1	4.2
75	12	11	PM	81		14040	9				
75	13	11	AM	81	710	4770	53	30	7.8	26.0	4.9
75	13	11	PM	81	550	16050	8				
75	14	11	AM	81	790	3850	50	18	7.8	26.4	4.8
75	14	11	PM	81		13520	10				
75	15	11	AM	81	1330	5970	50	19			
75	15	11	AM	81		16770	12				
75	16	11	AM	81	850	3040	55	25			
75	16	11	PM	81		6920	5				
75	17	11	AM	81	830	5410	55	30	7.5	25.8	6.1
75	17	11	PM	81		13790	8				
75	18	11	AM	81	970	5270	63	25	7.8	26.0	6.0
75	18	11	PM	81	690		99				25.9
75	19	11	AM	81	4810						
75	24	11	AM	81			38				
75	25	11	AM	81			49				
75	26	11	AM	81			60				
75	27	11	AM	81	2250	11160	110	7.2	3.8	10.3	
75	28	11	AM	81	2740	15120	100	7.0	4.8	9.9	
75	29	11	AM	81			60				
75	30	11	AM	81			60				
75	01	12	AM	81			60				
75	02	12	AM	81	1030		58	7.3	4.6	10.9	
75	03	12	AM	81	1420	7600	17	122	7.2	4.5	10.0
75	03	12	AM	81	2020	9890	28	92	7.0	4.5	10.3
75	04	12	AM	81	1840	8240	28	84	7.3	4.5	10.6
75	04	12	PM	81	1740		114	4.8	4.5	10.1	1.3
75	05	12	AM	81	2080	12760	28	136	7.2	4.5	9.8
75	06	12	AM	81	1550	6840	28	86	7.3	4.2	11.1
75	07	12	AM	81	850	3350	18	47			
75	08	12	AM	81	1100	5100	10	64	7.4	4.4	11.1
75	09	12	AM	81	1350	8550	21	100	7.4	4.2	10.8
75	09	12	PM	81	1170		180				0.1
75	15	12	AM	81	5220						
75	16	12	PM	81	5290						
75	17	12	AM	81	5830						
75	18	12	AM	81	6040	3990		7.0	5.3	8.3	
75	18	12	PM	81	5660			6.9	4.6	8.2	
75	19	12	AM	81	4960	3290		7.0	4.6	7.9	
75	19	12	PM	81	4640				4.4	9.0	4.2
75	20	12	AM	81	4050				4.6	9.5	
75	21	12	AM	81	3160				5.0	8.7	
75	22	12	AM	81	2470				5.0	8.8	
75	23	12	AM	81	2810	1970		7.1	5.4	9.2	
75	23	12	PM	81	2920			7.3	5.3	8.9	
75	24	12	AM	81	2690						
75	26	12	PM	81	2710						
75	27	12	AM	81	3250	2430		7.2	5.4	9.6	

REACTOR OPERATING RESULTS

YEAR	DATE DAY	MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR
75	27	12	PM	B1	2730								
75	28	12	AM	B1	3230								
75	30	12	AM	B1	3120								
76	01	01	AM	B1	3580								
76	02	01	AM	B1							5.0	8.2	
76	03	01	AM	B1	3990								
76	04	01	AM	B1	4100								
76	05	01	AM	B1	4510					7.2	5.0	7.2	
76	06	01	AM	B1	4400	3320				7.1	4.8	7.3	3.5
76	06	01	PM	B1	4510						5.2	6.3	
76	07	01	AM	B1	4750					7.0	5.5	7.2	
76	08	01	AM	B1	4980	3620				7.2	5.3	7.3	3.4
76	08	01	PM	B1	4610								
76	09	01	AM	B1	5850					7.1	5.5	6.4	
76	10	01	AM	B1				30					
76	11	01	AM	B1				30					
76	12	01	AM	B1				43			22.0	4.6	
76	13	01	AM	B1				49	250		22.5	4.3	
76	14	01	AM	B1	2000		9130		3		25.0	3.9	
76	15	01	AM	B1	1510		11060						
76	15	01	PM	B1				40		7.6	26.0	3.5	
76	16	01	AM	B1	1400		6230	61	14				
76	18	01	AM	B1	1400		12530	12					
76	18	01	PM	B1				45					
76	17	01	AM	B1				53					
76	19	01	AM	B1	1310		16560	15	12		25.5	5.6	
76	19	01	AM	B1			6000	43					
76	20	01	AM	B1	1080		18520	18	21		7.5	25.0	4.9
76	20	01	PM	B1			11210	11					
76	20	01	PM	B1			12900	20					
76	21	01	AM	B1	760	590	12900	8	17		7.9	27.0	5.8 20.6
76	21	01	PM	B1	800		3710	43	27				
76	21	01	PM	B1			13370	7					
76	22	01	AM	B1	1100		6290	53	14		7.7	26.0	5.2
76	22	01	PM	B1			14610	11					
76	23	01	AM	B1	510	380	2110	50	13		8.1	26.2	5.7
76	23	01	AM	B1			7840	17					
76	23	01	PM	B1							26.0	4.7	
76	24	01	AM	B1	448								
76	24	01	AM	B1	960								
76	30	01	AM	B1	2380						7.0	2.4	
76	02	02	AM	B1	6040					7.2	7.3	6.8	
76	03	02	AM	B1	6320					7.3	5.5	7.3	
76	04	02	AM	B1	6820					7.1	6.3	8.0	
76	05	02	AM	B1	4910					7.3	5.3	9.4	
76	06	02	AM	B1	6410						5.4	8.4	
76	08	02	AM	B1	6720					7.1	5.2	9.0	
76	09	02	AM	B1	6960	4960				7.2	5.1	9.4	
76	10	02	AM	B1	5990	4220				7.1	5.0	9.0	
76	11	02	AM	B1	5510					7.4	5.0	9.3	
76	12	02	AM	B1	5520					7.4	4.9	9.7	
76	13	02	AM	B1	5320					7.3	5.1	9.8	
76	14	02	AM	B1	5140	3660				7.3	4.9	10.0	
76	15	02	AM	B1	4630					7.4	4.5	4.1	
76	16	02	AM	B1	4290	3040				7.2	5.1	10.3	
76	17	02	AM	B1	4080					7.4	4.7	10.2	
76	18	02	AM	B1	4100	2840				7.5	4.8	10.2	
76	19	02	AM	B1	3600					7.3	5.0	10.4	
76	20	02	AM	B1	4060	2820				7.4	4.8	10.5	
76	21	02	AM	B1	3390	2400				7.5	4.8	10.7	
76	22	02	AM	B1	3100					7.5	4.5	11.6	

REACTOR OPERATING RESULTS

YEAR	DATE	MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR
76	22	02	PM	B1	3280								
76	23	02	AM	B1	2780	1970				7.5	4.4	11.4	
76	24	02	AM	B1	2680					7.5	4.7	10.6	
76	25	02	AM	B1	2870	2010				7.4	4.7	11.2	
76	01	03	PM	B1	2670	1990				7.6	5.3	10.4	
76	02	03	AM	B1	2520	1830				7.4	5.1	10.5	
76	03	03	AM	B1	1820					7.5	4.8	10.9	
76	04	03	AM	B1	1450					7.5	5.5	11.2	
76	05	03	AM	B1	1340					7.7	6.0	10.8	
76	08	03	AM	B1	2190	1580				7.6	5.3	11.0	
76	09	03	AM	B1	2280					7.6	5.3	10.5	
76	10	03	AM	B1	2260	1650				7.4	5.5	10.6	
76	11	03	AM	B1	2250					7.4	4.5	11.0	
76	12	03	AM	B1	2190	1700				7.5	4.3	11.2	
76	15	03	AM	B1	2680	1467				7.4	5.8	10.6	
76	16	03	AM	B1	3200					7.4	5.1	10.4	
76	17	03	AM	B1	3200	2340				7.4	4.7	10.7	
76	18	03	AM	B1	3380					7.4	5.1	10.7	
76	19	03	AM	B1	3280	2480				7.1	5.2	9.4	
76	22	03	AM	B1	3250	2390				7.3	5.7	10.4	
76	23	03	AM	B1	3230					7.3	7.9	3.1	
76	24	03	PM	B1	3520					7.4	5.1	10.6	
76	24	03	PM	B1	3550	2590				7.4	4.5	10.4	
76	25	03	AM	B1	3970					7.2	4.3	9.5	
76	25	03	PM	B1	3890								
76	26	03	PM	B1	3210	2510							
76	27	03	AM	B1	3950						5.0		
76	31	03	AM	B1	3750	2830				7.6	4.8	9.7	
76	01	04	AM	B1	3860					7.4	4.6	10.3	
76	02	04	AM	B1	3740	2810				7.5	11.3	8.6	
76	05	04	AM	B1	3080	2280				7.5	5.0	10.5	
76	06	04	AM	B1	2770					7.4	5.4	9.6	
76	07	04	AM	B1	3340	2530				7.6	4.7	9.4	
76	07	04	PM	B1	3180						4.8	9.4	
76	08	04	AM	B1	3300					7.2	5.2	10.0	
76	08	04	PM	B1	3220						4.5	8.8	
76	09	04	AM	B1	3500					7.3	5.2	10.0	
76	09	04	PM	B1	3060						4.8	9.0	
76	10	04	AM	B1	3330					7.2	5.0	11.5	
76	11	04	AM	B1	3060					7.2	5.0	10.0	
76	12	04	AM	B1	2940					7.1	5.1	10.1	
76	12	04	PM	B1	2850						4.5	9.4	
76	13	04	AM	B1	3070	2370				7.2	5.3	10.1	
76	13	04	PM	B1	3170						5.5	9.0	
76	14	04	AM	B1	3360	2570				7.4	4.4	10.1	
76	14	04	PM	B1	3030						4.8	9.4	
76	15	04	AM	B1	3240					7.2	5.3	9.7	
76	16	04	AM	B1	3310	2500				7.2	5.5	9.9	
76	17	04	AM	B1	3040					7.1	5.2	10.1	
76	18	04	AM	B1	2770					7.1	5.2	10.4	
76	19	04	AM	B1	2650	2050				7.3	5.0	10.0	
76	20	04	AM	B1	2800					6.9	5.3	9.9	
76	20	04	PM	B1	2640						4.7	9.2	
76	21	04	AM	B1	2700	2100				7.4	4.3	10.2	
76	21	04	PM	B1	2810								
76	22	04	AM	B1	2770					7.2	5.5	9.3	
76	22	04	PM	B1	2650								
76	23	04	AM	B1	2800	2190							
75	11	07	AM	B2	3040				22	7.5	22.0	6.8	

REACTOR OPERATING RESULTS

YEAR	DATE	MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR
75	14	07	AM	B2	4000				36	7.5	24.2	6.6	
75	15	07	AM	B2	4840		7310	13	48	7.4	24.3	4.3	
75	16	07	AM	B2	5150		10770	15	36	7.3	25.1	5.2	
75	17	07	AM	B2	6180		11220	20	21	7.3	25.2	5.4	
75	18	07	AM	B2	5390		12570	19	30	7.4	25.0	5.7	
75	20	07	AM	B2	5490		12240	19	24	7.4	25.3	5.5	
75	21	07	AM	B2	5160	2970	11720	19	44	6.5	25.3	2.4	17.5
75	22	07	PM	B2	5280				42				
75	23	07	AM	B2	5180		10990	19	38	6.2	25.6	4.5	
75	24	07	AM	B2	4840	2870	10680	19	42	6.2	25.3	4.8	18.0
75	24	07	PM	B2	5690				60		25.0	2.8	
75	25	07	AM	B2	4920				84				
75	26	07	PM	B2	5520				66	7.7	24.5	5.7	
75	30	07	AM	B2	5080				72	7.6	24.5	7.4	
75	31	07	AM	B2	1750				74	7.4	24.3	7.4	
75	01	08	AM	B2	1920				56	7.4	25.0	7.3	
75	02	08	AM	B2	1340								
75	03	08	AM	B2	1380				38	7.4	24.4	7.3	
75	05	08	PM	B2	1320								
75	06	08	AM	B2	1530				50	7.2	24.7	6.7	
75	06	08	PM	B2	1520								
75	07	08	AM	B2	1990				42	7.3	24.5	9.2	
75	08	08	AM	B2	1940				28	7.4	23.8	6.3	
75	09	08	AM	B2	1980				36	7.3	24.4	6.5	
75	10	08	AM	B2	1900				36	7.3	24.0	5.9	
75	11	08	AM	B2	1830	1290			32	6.7	24.9	4.2	
75	12	08	PM	B2	1510				30		24.9	3.9	
75	13	08	AM	B2	1120				50	6.3	25.5	4.0	
75	13	08	PM	B2	1670								
75	14	08	AM	B2	1780				24	7.1	24.5	6.1	
75	15	08	AM	B2	1590				24	7.3	24.5	7.3	
75	16	08	PM	B2	1550				20		25.0	3.1	
75	16	08	AM	B2	1520				22		25.0	5.1	
75	17	08	AM	B2	1290				22	6.8	25.0	4.9	
75	18	08	AM	B2	1180	840			28	6.6	25.4	3.0	
75	18	08	AM	B2	1130				24		25.4	3.6	
75	19	08	AM	B2	1110				43	6.8	23.8	3.8	
75	20	08	AM	B2	1570						8.7		
75	21	08	AM	B2	1540				160		7.5	11.8	
75	22	08	AM	B2	1440				82	7.1	7.9	8.7	
75	22	08	PM	B2	1870				46				
75	23	08	AM	B2	1780				42				
75	24	08	AM	B2	1790				34				
75	25	08	AM	B2	1800				33	7.0	8.0	8.0	
75	26	08	AM	B2	2260				29	7.2	8.6	7.7	
75	27	08	AM	B2	2650				35	7.2	7.8	7.9	
75	28	08	AM	B2	3090				36	7.1	7.5	7.5	
75	29	08	AM	B2	3530				25	7.2	8.5	7.2	
75	01	09	AM	B2	3800	2470			46	7.0	8.8	7.2	16.3
75	01	09	PM	B2	3730				82		9.0	6.8	
75	02	09	AM	B2	3890				86	7.1	8.6	6.5	
75	03	09	AM	B2					44	7.1	6.9	7.0	5.2
75	03	09	PM	B2	4120		9020	5	45		7.2	6.3	
75	04	09	AM	B2	4000				45				
75	08	09	AM	B2	4220			14	16	7.3			
75	09	09	AM	B2	6380			12	88				
75	10	09	AM	B2				10					
75	11	09	AM	B2	5720		18500	11	54		5.6	9.0	

REACTOR OPERATING RESULTS

YEAR	DATE	MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR
75	12	09	AM	B2				4					
75	13	09	AM	B2	5750		11470	20	14				
75	14	09	AM	B2					17				
75	15	09	AM	B2	6070		13430	28	28	7.2	5.0	10.0	
75	16	09	AM	B2	6200		10210	51	34	7.2	5.1	8.4	
75	17	09	AM	B2	5830		8210	37	22	7.1	5.8	8.2	
75	18	09	AM	B2			8660	27	14				3.6
75	18	09	PM	B2	5130				28	168	7.1	5.8	7.6
75	18	09	24 HR	COMPOSITE	5640	EB-C*	SUSPENDED SOLIDS =	8020	26	MG/L		5.6	9.5
75	19	09	AM	B2				18	5				
75	20	09	AM	B2	5540								
75	20	09	AM	B2				12	32				
75	21	09	AM	B2	5790		7980	28	26				
75	22	09	AM	B2			9840	10					
75	22	09	PM	B2	5840	3750			29	211	7.2	2.9	8.3
75	23	09	AM	B2	5550				15				2.8
75	23	09	24 HR	COMPOSITE	4870	OF EB SHOWS	SUSPENDED SOLIDS	11	46	7.3	25.0	6.7	
75	29	09	AM	B2	5070			18	45	7.1	24.6	6.8	
75	01	10	AM	B2				18					
75	02	10	AM	B2	5690		11210	18	42	7.4	24.0	6.4	
75	03	10	AM	B2				18					
75	04	10	AM	B2				18					
75	05	10	AM	B2				27	49	7.3	25.0	6.2	
75	06	10	AM	B2	9240		16300	17	44	7.3	24.4	6.3	
75	07	10	AM	B2	7640		16010	14	60	7.3	25.0	5.6	
75	08	10	AM	B2	8390		21030	15	47	6.6	25.4	4.3	8.4
75	09	10	AM	B2	8100	4960	17860	16	44	7.0	25.4	6.9	
75	09	10	PM	B2	7910			16	84				
75	10	10	AM	B2	8380		15260	16	122				
75	11	10	AM	B2	8020		15280	16	132				
75	12	10	AM	B2	7350		13790	16	84				
75	13	10	AM	B2	7250		15510	4	94	6.8	23.0	6.6	
75	14	10	AM	B2	7160			12	47	6.9	25.0	6.3	
75	15	10	PM	B2	7400		15845	16	65	6.6	24.4	5.7	12.8
75	17	10	AM	B2	7110	4260	14620	16	90				
75	17	10	PM	B2	6580				120	7.5	24.0	7.1	
75	20	10	AM	B2	5530				116	7.6	24.1	7.2	
75	21	10	AM	B2	5080				108	7.5	24.0	7.4	
75	22	10	AM	B2	4580				103	7.5	23.8	7.1	
75	23	10	AM	B2	4340				78	7.4	24.0	7.1	
75	24	10	AM	B2	3730				80	7.5	24.0	7.0	
75	26	10	AM	B2	2770				92				
75	27	10	AM	B2	2460				80	7.4	24.0	7.0	
75	29	10	AM	B2	1970				68				
75	29	10	PM	B2	1880				62	7.3	23.5	7.4	
75	30	10	AM	B2	1790								
75	30	10	PM	B2	1870				46	7.2	23.5	5.7	
75	31	10	AM	B2	2390				28	7.3	24.5	6.5	
75	05	11	AM	B2	2240				38	7.3	24.4	6.4	
75	06	11	AM	B2	2480				30	7.2	24.5	6.1	
75	07	11	AM	B2	2260				19	7.4	24.3	5.9	
75	10	11	AM	B2	2000				19	7.3	24.0	5.4	
75	12	11	AM	B2	1850				32	7.0	24.0	4.0	
75	13	11	AM	B2	1830								
75	13	11	PM	B2	1910	1320			57	6.5	23.8	4.5	
75	14	11	AM	B2	1880								

REACTOR OPERATING RESULTS

DATE YEAR DAY MON	TIME	REACTOR	HLSS	HLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR
75	15	11	AM	82	1830		31				
75	16	11	AM	82	1810		32				
75	17	11	AM	82	1670		32				
75	18	11	AM	82	1810		26	6	7.3	24.0	5.9
75	19	11	PM	82	1790		35		6.1	24.6	3.9
75	20	11	AM	82	1320						30.4
75	21	11	AM	82	1320						
75	22	11	AM	82	1320						
75	23	11	AM	82	1320						
75	24	11	AM	82	1320						
75	25	11	AM	82	1320						
75	26	11	AM	82	1320						
75	27	11	AM	82	1320						
75	28	11	AM	82	1320						
75	29	11	AM	82	1320						
75	30	11	AM	82	1320						
75	01	12	AM	82	1320						
75	02	12	AM	82	1320						
75	03	12	AM	82	1320						
75	04	12	AM	82	1320						
75	05	12	AM	82	1320						
75	06	12	AM	82	1320						
75	07	12	AM	82	1320						
75	08	12	AM	82	1320						
75	09	12	AM	82	1320						
75	10	12	AM	82	1320						
75	11	12	AM	82	1320						
75	12	12	AM	82	1320						
75	13	12	AM	82	1320						
75	14	12	AM	82	1320						
75	15	12	AM	82	1320						
75	16	12	AM	82	1320						
75	17	12	AM	82	1320						
75	18	12	AM	82	1320						
75	19	12	AM	82	1320						
75	20	12	AM	82	1320						
75	21	12	AM	82	1320						
75	22	12	AM	82	1320						
75	23	12	AM	82	1320						
75	24	12	AM	82	1320						
75	25	12	AM	82	1320						
75	26	12	AM	82	1320						
75	27	12	AM	82	1320						
75	28	12	AM	82	1320						
75	29	12	AM	82	1320						
75	30	12	AM	82	1320						
76	01	01	AM	82	3670		86				
76	02	01	AM	82					4.8	8.7	
76	03	01	AM	82	3680		64				
76	04	01	AM	82	4000		31				
76	05	01	AM	82	4350	8910	68		7.2	5.0	7.7
76	06	01	AM	82	4730	8390	82	181	7.2	5.2	7.7
76	07	01	AM	82	4320		62				
76	08	01	AM	82	4990	8680	84		7.2	5.3	7.5
76	09	01	AM	82	4970	9110	96	184	7.2	5.3	7.5
76	10	01	AM	82	4760		72				
76	11	01	AM	82	5590		94		7.1	5.6	8.8
76	12	01	AM	82							
76	13	01	AM	82	3810		340		21.3	5.0	8.8
76	14	01	AM	82	3250		28		21.6	5.3	8.8
76	15	01	AM	82	3130		41		22.0	5.3	8.8
76	16	01	AM	82	1760		373		7.3	24.0	9.1
76	17	01	AM	82			15				
76	18	01	AM	82	3470	7300	20		22.8	5.9	

REACTOR OPERATING RESULTS

YEAR	DATE DAY	MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR
76	19	01	AM	B2	1640				27		23.0	6.3	
76	20	01	AM	B2	1820				27		24.0	5.6	
76	21	01	AM	B2	1920	1280			26 80	7.0	24.8	3.7	39.7
76	21	01	PM	B2	1680				29				
76	22	01	AM	B2	1330				36	6.9	24.0	4.5	
76	22	01	PM	B2					43				
76	23	01	AM	B2	800	540			49 105	7.1	24.0	4.0	
76	23	01	PM	B2	960						24.0	4.2	
76	24	01	AM	B2	780								
76	30	01	AM	B2	2350		5220		29		8.0	6.4	
76	31	01	AM	B2				13					
76	02	02	AM	B2	5750		12980	18		7.3	8.0	8.3	
76	03	02	AM	B2	6110		13470	20	18	7.4	6.0	8.7	
76	04	02	AM	B2	6540		12780	21	28	7.3	6.8	9.4	
76	05	02	AM	B2	4890		9390	23	80	7.4	6.8	9.9	
76	06	02	AM	B2	6100		14850	23	46	7.4	6.0	9.7	
76	07	02	AM	B2				26					
76	08	02	AM	B2	6470		12850	22	29	7.2	5.8	9.0	
76	09	02	AM	B2	6690	4700	12760	27	19	7.4	5.8	9.4	
76	10	02	AM	B2	5880	4220	13070	27	22	7.3	5.7	9.2	
76	11	02	AM	B2	5640		12410	22	32	7.5	5.6	3.6	
76	12	02	AM	B2	5330		11900	18	31	7.4	5.6	9.7	
76	13	02	AM	B2	5230		11660	23	34	7.3	5.8	9.7	
76	14	02	AM	B2	5050	3520	10690	32	35	7.5	5.0	9.3	
76	15	02	AM	B2	4910		9770	11	49	7.5	5.0	10.4	
76	16	02	AM	B2	4380	3170	9260	18	61	7.4	5.3	10.4	
76	17	02	AM	B2	4140		7950	18	52	7.5	5.4	10.4	
76	18	02	AM	B2	4040	2810	7370	18	55	7.4	5.3	10.6	
76	19	02	AM	B2	3390	2340	7370	18	55	7.5	5.3	10.6	
76	20	02	AM	B2	3460	2450	6670	23	48	7.6	5.2	10.8	
76	21	02	AM	B2	1870		22330	4	44	7.7	4.9	11.4	
76	22	02	PM	B2			5670	9					
76	23	02	AM	B2	2760								
76	24	02	AM	B2	2860	2010	6010	18	49	7.6	5.0	11.4	
76	25	02	AM	B2	2920		5230	20	62	7.5	5.1	11.4	
76	26	02	AM	B2	2800	2020	8110	12	55	7.5	5.3	11.3	
76	27	02	AM	B2				22					
76	28	02	AM	B2				22					
76	29	02	AM	B2				22					
76	01	03	PM	B2	2620	1950	4770	15	42	7.6	5.8	10.5	
76	02	03	AM	B2	2680	1920	5340	11	52	7.4	5.5	10.6	
76	03	03	AM	B2	1900		3660	6	66	7.5	5.2	10.7	
76	04	03	AM	B2	1560		3010	72	72	7.5	5.8	10.8	
76	05	03	AM	B2	1410		2540	82	82	7.7	6.0	10.8	
76	08	03	AM	B2	2290	1630	6560	11	66	7.8	5.5	11.1	
76	09	03	AM	B2	2250		3840	6	59	7.5	5.7	11.3	
76	10	03	AM	B2	2210	1640	5960	6	56	7.3	6.0	11.2	
76	11	03	AM	B2	2360		4160	77	77	7.5	5.0	10.6	
76	12	03	AM	B2	2320	1770	3250	110	110	7.5	4.7	11.0	
76	15	03	AM	B2	2670	1981	5160	5	64	7.5	6.1	10.6	
76	16	03	AM	B2	3190		5990	11	51	7.4	5.6	10.6	
76	17	03	AM	B2	3210	2320	6670	11	68	7.3	5.3	10.6	
76	18	03	AM	B2	3270		6180	11	56	7.3	5.7	10.6	
76	19	03	AM	B2	3320	2460	5660	11	72	7.1	5.9	9.3	
76	22	03	AM	B2	3310	2470	5300	16	38	7.3	6.2	10.6	
76	23	03	PM	B2	3340		7450	11	45	7.3	7.7	9.5	
76	24	03	AM	B2	3500		7660	8	51	7.3	4.9	10.5	

REACTOR OPERATING RESULTS

YEAR	DATE	MON	TIME	REACTOR	MLSS	MLVSS	WASTE CONC	IGAL WASTE	EFFLUENT SS ALK	PH	REACTOR TEMP	DO	OUR
76	24	03	PM	B2	3970	2810	9100	12	51				
76	25	03	AM	B2	4690		5630	20	56	7.2	5.0	9.5	
76	26	03	PM	B2	3650				56		5.0	9.0	
76	27	03	PM	B2	3710	2740	7690	12	52				
76	28	03	AM	B2	3650		7070	12	41		5.5		
76	29	03	AM	B2				12					
76	30	03	AM	B2				12					
76	31	03	AM	B2				12					
76	01	04	AM	B2	4080	3120	6440	14	42	7.5	5.3	9.3	
76	02	04	AM	B2	3970		6760	17	44	7.5	5.3	9.3	
76	03	04	AM	B2	3100	2310	6610	19	48	7.5	11.0	8.0	
76	04	04	AM	B2	3100		5480	20	48	7.5	4.9	10.4	
76	05	04	AM	B2	3070		6290	15	48	7.5	5.3	9.0	
76	06	04	AM	B2	3300	2490	5120	15	138	7.5	5.1	9.0	
76	07	04	AM	B2	3360		5920	21	132	7.5	5.6	9.0	
76	08	04	PM	B2					C 31				
76	09	04	AM	B2	3470				43		5.2	9.4	
76	10	04	AM	B2	3390		5720	15	40	7.3	5.5	9.4	
76	11	04	AM	B2	3450				C 40	152		9.4	
76	12	04	AM	B2	3190		5830	19	47	7.1	5.0	9.8	
76	13	04	AM	B2					C 40	140			
76	14	04	AM	B2	3120		5120	16	46	7.2	5.0	9.5	
76	15	04	AM	B2					C 23	156			
76	16	04	PM	B2	3210		5740	16		7.1	5.3	9.8	
76	17	04	AM	B2	3270				C 19	176		9.5	
76	18	04	AM	B2	3080	2350	3810	21	C 22	170	7.2	5.5	9.4
76	19	04	PM	B2	3340				C 22	170	7.2	5.5	9.4
76	20	04	AM	B2	3350	2470	5300	22	C 38	202	7.4	4.8	9.6
76	21	04	AM	B2	3420		6070	19	C 19	184	7.1	5.7	9.3
76	22	04	AM	B2	3280	2500	6140	18	C 16	168	7.1	6.0	9.3
76	23	04	AM	B2	3140		5790	20	C 9	148	7.1	5.8	9.4
76	24	04	PM	B2	3310				C 43		5.0	9.4	
76	25	04	AM	B2	3440		4790	20	C 15	178	7.1	5.8	9.6
76	26	04	AM	B2	2640	2030	4970	20	C 11	186	7.2	5.6	9.9
76	27	04	AM	B2	2780		4900	23	C 46	196	7.0	5.8	9.2
76	28	04	PM	B2	2720								
76	29	04	AM	B2	2740	2090	4850	17	C 12	200	7.4	4.7	9.6
76	30	04	PM	B2	2910								
76	01	05	AM	B2	2790		5080	20	C 8	192	7.2	5.7	8.9
76	02	05	PM	B2	2800								
76	03	05	AM	B2	2740	2110	5140	20					
76	04	05	AM	B2	3750	2670	13440	12096	10				
76	05	05	AM	B2	3630		13300	11970	10				
76	06	05	AM	B2	3620		12550	11295	10		7.0	8.4	3.7
76	07	05	AM	B2	3600		12520	11258	11		7.1	9.0	7.5
76	08	05	AM	B2	3790		11540	10386	7				
76	09	05	AM	B2	3450		10750	9679	5				
76	10	05	AM	B2	3260		10840	9755	3		7.1	8.5	10.3
76	11	05	AM	B2	3380		10150	9136	6		7.2	8.4	9.4
76	12	05	AM	B2	3300		8600	6192	6		7.3	8.5	8.1
76	13	05	AM	B2	3130		11090	8988	7		7.2	8.5	8.0
76	14	05	AM	B2	3050		9590	7758	7		7.2	8.5	8.9
76	15	05	AM	B2	3030		8930	4832	7		7.3	8.5	7.8
76	16	05	AM	B2	3080		8980	7274	7		7.4	8.6	9.3
76	17	05	AM	B2	2980		7500	1147	9		7.5	8.6	9.2
76	18	05	AM	B2	2900		6210	5030	8		7.3	7.6	8.7
76	19	05	AM	B2	2240		6940	6246	6		7.2	8.6	8.2

ANALYSES

YEAR	DAY	MON	SAMPLE DESIGNATION	UNFILTERED				FILTERED										METAL ANALYSIS			
				COD	BOD	TKN	TP	COD	BOD	FOC	NH4N	NO2N	NO3N	TKN	TP	UNFILTERED FE	FILTERED AL	UNFILTERED FE	FILTERED AL	UNFILTERED FE	FILTERED AL
75	11	07	RF-GPM																		
75	11	07	FEED																		
75	15	07	RF-GPM																		
75	17	07	FEED																		
75	23	07	RF-GPM																		
75	23	07	FEED	292	128	106.0	6.6	94	37	40	85.0	0.0	0.0	95.7							
75	22	07	RF-GPM																		
75	22	07	FEED																		
75	24	07	RF-GPM																		
75	24	07	FEED	304	88	99.2	5.5	79	33	42	75.0	0.1	1.3	89.6	2.5						
75	24	07	RF-GPM																		
75	24	07	FEED																		
75	28	07	RF-GPM																		
75	28	07	FEED																		
75	31	07	RF-GPM																		
75	31	07	FEED																		
75	01	08	RF-GPM																		
75	01	08	FEED																		
75	12	08	RF-GPM																		
75	12	08	FEED	312	125	78.1	7.9	94	45	29	68.0	0.0	0.0	71.4	3.6						
75	14	08	RF-GPM																		
75	14	08	FEED																		
75	18	08	RF-GPM																		
75	18	08	FEED	366	105	83.9	7.5	132	39	45	36.0	0.1	0.1	78.0	4.0						
75	18	08	RF-GPM																		
75	18	08	FEED																		
75	20	08	RF-GPM																		
75	20	08	FEED																		
75	24	08	RF-GPM																		
75	24	08	FEED																		
75	28	08	RF-GPM																		
75	28	08	FEED																		
75	31	08	RF-GPM																		
75	31	08	FEED	272	76	25.8	7.5	62	19	16	13.8	0.2	0.4	18.4	3.5						
75	01	09	RF-GPM																		
75	01	09	FEED																		
75	03	09	RF-GPM																		
75	03	09	FEED	308	145	31.2	6.5	86	36	38	18.0	0.0	0.5	23.5	2.6						
75	03	09	RF-GPM																		
75	03	09	FEED																		
75	09	09	RF-GPM																		
75	09	09	FEED																		
75	11	09	RF-GPM																		
75	11	09	FEED																		
75	16	09	RF-GPM																		
75	16	09	FEED																		
75	18	09	RF-GPM																		
75	18	09	FEED	98	46	13.9	2.7	37	21	23	11.5	0.2	7.0	13.7	1.9						
75	22	09	RF-GPM																		
75	22	09	FEED	292	89	29.3	2.7	59	33	33	19.8	0.2	8.9	22.7	1.4						
75	22	09	RF-GPM																		
75	22	09	FEED																		
75	30	09	RF-GPM																		
75	30	09	FEED																		
75	30	09	AL-FEED-MIX																		
75	02	10	RF-GPM																		
75	02	10	FEED																		
75	07	10	RF-GPM																		
75	07	10	FEED																		
75	09	10	RF-GPM																		
75	09	10	FEED																		
75	09	10	RF-GPM																		
75	09	10	FEED	358	93	84.4	23.3	88	20	25	69.0	0.0	0.0	69.9	3.7						
75	09	10	RF-GPM																		
75	09	10	FEED																		

ANALYSES

YEAR	DAY	MON	SAMPLE DESIGNATION	UNFILTERED				FILTERED								METAL ANALYSIS			
				COD	BOD	TKN	TP	COD	BOD	FOC	NH4N	NO2N	NO3N	TKN	TP	UNFILTERED FE	FILTERED AL	UNFILTERED FE	FILTERED AL
75	15	10	RFF-GPM														5.3		
75	17	10	RFF-C	352	90	80.9	6.8	109	46	37	19.0	0.4	0.2	71.1	3.0		3.6		0.3
75	17	10	RFF-C														3.5		
75	17	10	RFF-GPM														3.3		
75	22	10	RFF-GPM														256		
75	22	10	AL-FEED														2.4		
75	24	10	RFF-GPM														4.1		
75	28	10	RFF-GPM														250		
75	28	10	AL-FEED														3.6		
75	31	10	RFF-GPM														1.5		
75	05	11	RFF-GPM														220		
75	05	11	AL-FEED														1.3		
75	07	11	RFF-GPM														1.0		
75	11	11	RFF-GPM	305	114	82.8	6.4	111	37	35	60.0	0.1	0.2	74.3	3.2		2.0		0.5
75	13	11	RFF-GPM														2.1		
75	13	11	RFF-GPM																
75	18	11	RFF-GPM	600	139	98.5	16.7	93	31	39	64.0	0.0	0.0	78.5	6.6		5.5		0.1
75	18	11	RFF-GPM														1.8		
75	18	11	RFF-GPM																
75	18	11	RFF-GPM														1.5		0.1
75	18	11	RFF-GPM	350	105	91.1	9.1	96	36	46	67.0	0.1	0.3	81.2	5.3		0.6		
75	02	12	RFF-GPM														163		
75	02	12	AL-FEED														3.7		
75	04	12	RFF-GPM																
75	04	12	RFF-GPM	300	120	36.8	6.7	98	37	39	23.5	0.4	0.8	29.6	3.4		0.7		0.1
75	04	12	RFF-GPM														2.7		0.3
75	09	12	RFF-GPM														4.1		
75	09	12	RFF-GPM																
75	17	12	RFF-GPM	210	79	37.5	4.2	53	24	28	25.5	0.5	2.3	31.6	2.4		318.0		
75	17	12	RFF-GPM														217		
75	17	12	RFF-GPM														1.9		
75	18	12	RFF-GPM																
75	19	12	RFF-GPM	204	87	21.9	3.7	90	21	21	16.0	0.3	1.1	20.8	3.1		0.6		0.2
75	19	12	RFF-GPM														0.5		
75	19	12	RFF-GPM	302	72	36.1	9.2	98	23	11	22.0	0.5	1.0	23.2	3.5		0.6		0.1
75	23	12	RFF-GPM														0.3		
75	27	12	RFF-GPM	202	49	24.9	4.8	85	22	34	18.6	0.1	0.5	19.7	2.8		3.1		0.4
75	27	12	RFF-GPM																
75	06	01	RFF-GPM	284	62	31.1	4.4	92	27	25	26.8	0.6	5.8	27.0	2.3		0.7		0.2
75	06	01	RFF-GPM														0.5		
75	08	01	RFF-GPM	520	132	47.3	12.1	92	24	28	26.3	0.7	11.0	28.3	4.1		2.6		0.4
75	08	01	RFF-GPM																
75	08	01	RFF-GPM	342	94	41.3	7.1	90	30	32	26.0	0.4	11.6	29.3	2.7		0.9		0.1
75	08	01	RFF-GPM														0.5		
75	08	01	RFF-GPM																
75	20	01	RFF-GPM														1.9		
75	20	01	RFF-GPM														248		
75	21	01	RFF-GPM	888	122	85.3	6.9	105	40	34	79.0	0.1	0.1	79.9	2.3		3.4		0.4
75	21	01	RFF-GPM														1.9		
75	21	01	RFF-GPM														1.9		
75	21	01	RFF-GPM														2.1		0.6
75	10	02	RFF-GPM	299		28.3		88			18.0	0.6	3.9	19.8					
75	10	02	RFF-GPM	210		18.4		68			15.0	0.6	4.6	15.6					
75	10	02	RFF-GPM	267		20.7		72			13.0	0.6	3.6	13.9					
75	10	02	RFF-GPM	254		17.6		44			8.3	0.4	8.5	10.6					

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YEAR	DAY	MON	SAMPLE DESIGNATION	UNFILTERED			TP	FILTERED				TP	METAL ANALYSIS		
				COD	800	TKN		NH4N	NO2N	NO3N	TKN		UNFILTERED FE	FILTERED AL	FILTERED FE
76	14	02	Q	144	12.6	44	12.0	0.4	6.3	12.2					
76	15	02	Q	32	11.7	32	6.4	0.2	4.2	8.5					
76	16	02	Q	168	13.6	48	7.3	0.4	6.2	10.9					
76	17	02	Q	152	12.5	40	7.6	0.3	5.9	9.6					
76	18	02	Q	191	12.4	57	7.4	0.3	4.6	8.3					
76	19	02	Q	154	12.4	49	9.6	0.3	3.9	9.8					
76	20	02	Q	183	18.9	43	17.0	0.6	4.5	17.3					
76	21	02	Q	122	9.5	33	5.2	0.3	4.8	7.0					
76	22	02	Q	139	9.7	49	7.2	0.3	4.7	8.4					
76	23	02	Q	211	15.8	70	9.8	0.4	2.8	11.8					
76	24	02	Q	178	15.6	66	11.8	0.5	4.3	12.8					
76	24	02	Q-7HR	213	16.9	74	13.0	0.5	3.4	16.4					
76	25	02	Q	184	16.3	57	10.1	0.3	2.1	14.0					
76	26	03	Q								2.9				
76	27	03	Q								1.6				
76	28	03	Q								2.2				
76	29	03	Q								1.7				
76	30	03	Q								4320.0				
76	31	03	Q								2.2				
76	01	04	Q								1.5				
76	02	04	Q	251	19.2	3.7	78	10.0	0.4	1.0	14.3	1.8			
76	03	04	Q	276	17.1	4.6	78	11.7	0.5	1.6	13.0	2.4	0.3		
76	04	04	Q								4.3		0.8		
76	05	04	Q								4.4				
76	06	04	Q	259	16.3	4.1	66	10.0	0.4	1.0	13.4	1.4			
76	07	04	Q	144	15.2	2.7	45	10.0	0.2	1.7	12.6	1.8	0.5		
76	08	04	Q								8.2		0.3		
76	09	04	Q								1.8				
76	10	04	Q								8.1				
76	11	04	Q	140	16.2	3.1	53	10.5	0.2	1.4	13.5	2.2	0.4		
76	12	04	Q	206	18.9	3.5	78	12.0	0.4	1.1	13.7	2.1	0.4		
76	13	04	Q								1.7				
76	14	04	Q								1.5		0.4		
76	15	04	Q	200	18.3	3.7	54	14.0	0.5	2.1	16.4	2.6			
76	16	04	Q								1.8				
76	17	04	Q	217	13.3	4.5	92	11.3	0.2	1.2	14.4	2.9	0.3		
76	18	04	Q								1.2		2.3		
76	19	04	Q	183	17.3	3.0	96	11.5	0.2	0.7	15.0	2.2	0.5		
76	20	04	Q								1.2				
76	21	04	Q								2.4				
76	22	04	Q								4080.0				
76	23	04	Q	142	13.8	2.1	62	9.9	0.2	0.6	11.0	1.9			
76	24	04	Q	92	12.7	2.2	67	10.3	0.1	0.6	11.4	1.9	0.5		
76	25	04	Q								0.5		0.3		
76	26	04	Q	100	15.3	2.6	38	11.6	0.1	0.5	13.6	2.2	0.3		
76	27	04	Q								0.6				
76	28	04	Q	183	21.0	4.8	66	13.2	0.1	0.4	15.0	2.2	0.7		
76	29	04	Q								2.7				
76	30	04	Q	320	18.7	4.9	54	14.6	0.2	0.5	16.0	3.2	0.8		
76	31	04	Q	157	20.5	2.8	108	13.6	0.2	0.0	18.3	2.1	0.4		
76	01	05	Q								1.5				
76	02	05	Q								12.6				
76	03	05	Q	219	18.9	3.6	99	14.3	0.2	0.1	16.1	2.3			
76	04	05	Q								5.0		4.7		
76	05	05	Q								1.3				
76	21	04	RF-0830	162	12.5	3.9	50	6.6	0.1	0.1	9.8	2.4			

ANALYSES

YEAR DAY MON			SAMPLE DESIGNATION	UNFILTERED			TP	FILTERED							METAL ANALYSIS			
COD	BOD	TKN	COD	BOD	FOC	NH4N		NO2N	NO3N	TKN	TP	UNFILTERED FE	FILTERED AL	UNFILTERED FE	FILTERED AL			
75	21	04	RF-1030	120		19.3	3.3	46	12.2	0.0	0.1	17.1	2.3					
75	21	04	RF-1230	141		28.7	3.9	91	22.2	0.0	0.2	24.8	2.9					
75	21	04	RF-1430	290		28.6	4.3	124	28.3	0.1	0.0	28.0	2.6					
75	21	04	RF-1630	349		26.2	4.4	129	23.3	0.0	0.0	24.0	0.6					
75	21	04	RF-1830	237		23.8	3.0	158	13.5	0.2	0.0	19.4	1.8					
75	21	04	RF-2030	270		23.1	3.6	141	12.8	0.3	0.0	17.7	2.3					
75	21	04	RF-2230	188		18.9	3.4	116	12.7	0.2	0.0	17.3	3.7					
75	21	04	RF-2430	166		16.4	3.9	108	11.5	0.2	0.0	14.4	3.4					
75	22	04	RF-0230	290		16.4	3.8	228	10.5	0.2	0.0	12.3	3.6					
75	22	04	RF-0430	162		15.1	3.3	91	8.7	0.2	0.1	11.0	3.3					
75	22	04	RF-0630	180		11.2	3.0	58	6.7	0.2	0.3	8.5	2.6					
75	22	07	EA-C	60	6	9.5	3.4	49	9.1	1.3	4.9	6.3	1.9					
75	22	07	EA-C											0.8	0.5			
75	22	07	MLA1-GAM			253.0												
75	22	07	MLA2-GAM			229.0								140.0				
75	22	07	MLA1-GAM											135.0				
75	22	07	MLA2-GAM															
75	24	07	EA-C	60	6	5.8	3.7	40	3.3	0.2	41.8	3.8	3.1	1.2	0.3			
75	24	07	EA-C															
75	24	07	MLA1-GAM			188.									0.3			
75	24	07	MLA2-GAM			218.												
75	24	07	MLA1-GPM											111.0				
75	24	07	MLA2-GPM											370.0				
75	24	07	RSA-GPM											208.0				
75	24	07	EA-C											0.8				
75	12	08	EA-C	50	9	5.2	4.2	36	2.2	0.3	34.7	2.7	3.2	1.0	0.4			
75	12	08	EA-C															
75	12	08	MLA1-GAM			179.0												
75	12	08	MLA2-GAM			115.0												
75	12	08	MLA1-GPM											126.0				
75	12	08	MLA2-GPM											125.0				
75	12	08	RSA-GPM											235.0				
75	12	08	EA-C											0.7				
75	18	08	EA-C	70	13	6.9	3.4	55	3.7	6.8	37.0	5.8	3.0	0.8	0.4			
75	18	08	EA-C															
75	18	08	MLA1-GAM			104.3												
75	18	08	MLA2-GAM			74.0												
75	18	08	MLA1-GPM											63.0				
75	18	08	MLA2-GPM											55.0				
75	18	08	RSA-GPM											120.0				
75	18	08	EA-GPM											0.5				
75	01	09	EA-C	68	10	14.4	2.8	49	9.8	0.1	3.7	13.9	2.1	0.8	0.9			
75	01	09	EA-C															
75	01	09	MLA1-GAM			267.0												
75	01	09	MLA2-GAM			277.0												
75	01	09	MLA1-GAM											69.0				
75	01	09	MLA2-GAM											80.5				
75	01	09	RSA-GAM											192.0				
75	01	09	EA-GAM											1.2				
75	03	09	EA-C	86	15	20.5	2.7	56	14.9	0.1	2.7	18.7	1.8	1.7	0.3			
75	03	09	EA-C															
75	03	09	MLA1-GAM			245.0												
75	03	09	MLA2-GAM			285.0												
75	03	09	MLA1-GPM											102.0				
75	03	09	MLA2-GPM											96.0				
75	03	09	RSA-GPM											213.0				
75	03	09	EA-GPM											1.2				
75	18	09	EA-C	38	7	12.1	1.7	32	9.0	0.5	11.0	11.1	1.6					
75	18	09	EA-C											0.8	0.7			
75	18	09	MLA1-GAM			258.0												

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YEAR	DAY	MON	SAMPLE DESIGNATION	UNFILTERED			TP	FILTERED							METAL ANALYSIS		FILTERED	
				COD	BOD	TKN		COD	BOD	FOC	NH4N	NO2N	NO3N	TKN	TP	UNFILTERED FE	AL	FE
75	18	09	MLA2-GAM			242.0												
75	18	09	MLA1-GPM											81.0				
75	18	09	MLA2-GPM											80.0				
75	18	09	RSA-GPM											153.0				
75	18	09	EPA-GPM											0.6				
75	22	09	EPA-C	45	9	15.1	1.5	36	5	15	13.0	0.2	8.0	14.2	1.1			
75	22	09	MLA1-GAM			282.0								0.4		0.6		
75	22	09	MLA2-GAM			248.0												
75	22	09	MLA1-GPM											12.0				
75	22	09	MLA2-GPM											86.0				
75	22	09	RSA-GPM											138.0				
75	22	09	EPA-GPM											0.5				
75	09	10	EPA-C	47	4	9.1	14.9	33	3	10	1.5	0.1	69.9	3.3	2.6			
75	09	10	MLA1-GPM			660.0								0.9		0.2		
75	09	10	MLA2-GPM			250.0												
75	09	10	MLA1-GPM											106.0				
75	09	10	MLA2-GPM											51.4				
75	09	10	RSA-GPM											1.3				
75	09	10	EPA-GPM											34.0				
75	17	10	EPA-C	58	8	9.8	2.2	43	5	11	7.1	0.5	67.5	7.1	1.6			
75	17	10	MLA1-GPM			153.0								0.6		1.1		
75	17	10	MLA2-GPM			270.0												
75	17	10	MLA1-GPM											97.0				
75	17	10	MLA2-GPM											120.0				
75	17	10	RSA-GPM											251.0				
75	17	10	EPA-GPM											1.6				
75	13	11	EPA-C	65	7	6.9	2.9	45	3	11	3.4	5.4	39.6	4.2	2.4			
75	13	11	MLA1-GAM			217.0								0.5		0.0		
75	13	11	MLA2-GAM			196.0												
75	13	11	MLA1-GPM											80.0				
75	13	11	MLA2-GPM											80.0				
75	13	11	RSA-GPM											160.0				
75	13	11	EPA-GPM											0.5				
75	18	11	EPA-C	56	6	9.5	5.1	42	6	10	1.3	0.8	38.2	5.6	4.5			
75	18	11	MLA1-GAM			226.0								0.2		0.0		
75	18	11	MLA2-GAM			187.0												
75	18	11	MLA1-GPM											49.1				
75	18	11	MLA2-GPM											51.5				
75	18	11	RSA-GPM											100.0				
75	18	11	EPA-GPM											6.1				
75	18	11	EPA-C-15HR	57	4	4.7	5.7	47	7	10	1.1	1.0	38.0	2.9	5.0			
75	18	11	EPA-C-15HR											0.2		0.0		
75	04	12	EPA-C											6.3		0.2		
75	04	12	MLA1-GAM			190.0												
75	04	12	MLA2-GAM			221.0												
75	04	12	EPA-GPM															
75	04	12	MLA1-GAM											0.4				
75	04	12	MLA2-GAM											56.6				
75	04	12	RSA-GAM											48.0				
75	04	12	EPA-C-16HR	54	8	19.1	2.6	42	6	12	11.0	2.6	7.9	16.7	1.9			
75	04	12	EPA-C-16HR															
75	09	12	MLA1-GAM											0.2		0.1		
75	09	12	MLA2-GAM											54.0				
75	09	12	EPA-GAM											51.0				
75														0.4				

ANALYSES

YEAR	DAY	MON	SAMPLE DESIGNATION	UNFILTERED			TP	FILTERED							METAL ANALYSIS				
				COD	BOD	TKN		COD	BOD	FOC	NH4N	NO2N	NO3N	TKN	TP	UNFILTERED FE	FILTERED AL	FILTERED FE	FILTERED AL
75	09	12	RSA-GAM															117.0	
75	09	12	EA-C-10HR	50	8	24.9	0.9	41	5	13	16.5	2.9	8.0	22.8	1.0			0.3	0.2
75	09	12	EA-C																
75	09	12	MLA1-GAM			283.0													
75	09	12	MLA2-GAM			242.0													
75	18	12	MLA1-GAM			57.0													
75	18	12	MLA2-GAM			53.0													
75	18	12	MLA1-GPM															48.0	
75	18	12	MLA2-GPM															54.6	
75	18	12	EA-GPM															0.3	
75	18	12	RSA-GPM															91.0	
75	19	12	EA-C	69	9	12.2	3.5	49	5	11	7.8	5.9	9.3	10.5	2.9			0.3	0.1
75	19	12	EA-C																
75	19	12	MLA1-GPM			221.0													
75	19	12	MLA2-GPM			78.0													
75	19	12	MLA1-GPM															54.0	
75	19	12	MLA2-GPM															51.4	
75	19	12	EA-GPM															0.3	
75	19	12	RSA-GPM															78.0	
75	23	12	EA-C	114	6	14.4	4.4	57	5	9	8.8	7.4	11.6	10.0	2.5			0.2	0.1
75	23	12	EA-C																
75	23	12	MLA1-GPM			49.0													
75	23	12	MLA2-GPM			36.0													
75	23	12	MLA1-GAM															42.0	
75	23	12	MLA2-GAM															36.0	
75	23	12	EA-GAM															0.2	
75	23	12	RSA-GAM															66.0	
75	27	12	EA-C	74	9	8.1	3.6	62	7		2.3	7.6	15.0	5.8	2.2			0.3	0.1
75	27	12	EA-C																
75	27	12	MLA1-GPM															34.8	
75	27	12	MLA2-GPM															38.0	
76	06	01	EA-C	77	11	16.3	2.5	62	4	16	12.0	2.8	14.8	13.5	2.0				
76	06	01	EA-C															0.9	0.1
76	06	01	MLA1-GAM															26.8	
76	06	01	MLA2-GAM															26.8	
76	06	01	MLA1-GAM			199.0													
76	06	01	MLA2-GAM			261.0													
76	06	01	EA-GAM															0.4	
76	06	01	RSA-GAM															50.0	
76	08	01	EA-C-11HR	83	13	19.3	3.7	52	6	15	14.0	5.8	5.8	15.9	2.1				
76	08	01	EA-C-11HR															0.4	0.1
76	08	01	MLA1-GPM															21.2	
76	08	01	MLA2-GAM															22.4	
76	08	01	MLA1-GAM			204.0													
76	08	01	MLA2-GAM			190.0													
76	08	01	EA-GPM															0.4	
76	08	01	RSA-GAM															44.8	
76	21	01	EA-C	63	7	15.5	1.9	50	4	13	13.9	4.1	60.0	14.8	1.6				
76	21	01	EA-C													0.4		0.2	
76	21	01	MLA1-GAM			176.0													
76	21	01	MLA2-GAM			157.0													
76	21	01	EA-GAM															0.5	
76	21	01	MLA1-GAM															120.0	
76	21	01	MLA2-GAM															112.0	
76	21	01	RSA-GAM															234.0	
76	23	01	EA-C															1.3	0.3
76	23	01	MLA1-GAM															115.0	
76	23	01	MLA2-GAM															105.0	
76	23	01	RSA-GAM															260.0	
76	23	01	EA-GAM															0.6	

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YEAR	DAY	MON	SAMPLE DESIGNATION	UNFILTERED		TP	FILTERED				METAL ANALYSIS			
				COD	BOD		FOC	NH4N	NO2N	NO3N	TKN	TP	UNFILTERED FE	FILTERED AL
76	10	02	A-C	52	5.1	60		0.8	0.1	18.2	2.4			
76	11	00	A-CC	52	1.7	155		1.1	0.1	19.0	1.5			
76	12	02	A-CC	48	1.7	40		0.4	0.0	20.4	1.4			
76	13	00	A-CC	44	2.0	28		0.2	0.0	21.1	1.6			
76	14	00	A-CC	52	1.1	24		0.3	0.0	8.6	1.1			
76	15	00	A-CC	40	1.9	28		0.3	0.0	7.9	1.6			
76	16	00	A-CC	36	1.9	28		0.5	0.3	12.3	1.8			
76	17	00	A-CC	40	1.9	28		0.4	0.0	13.5	1.1			
76	18	00	A-CC	45	2.7	41		0.3	0.0	13.1	2.0			
76	19	00	A-CC	41	1.9	24		0.7	0.0	13.9	0.9			
76	20	00	A-CC	37	1.4	33		0.5	0.0	15.6	1.0			
76	21	02	A-CC	37	1.3	33		0.4	0.0	14.8	1.3			
76	22	02	A-CC	37	2.0	37		0.3	0.0	12.9	1.6			
76	23	03	A-CC	45	1.9	33		0.5	0.0	14.3	1.1			
76	24	00	A-CC	50	1.4	37		0.7	0.1	18.8	0.7			
76	25	03	A-7HR	25	2.2	33		0.6	0.0	14.1	2.0			
76	26	00	MLA11-GAM		2.8	37		0.4	0.0	14.4	2.6			
76	26	00	MLA2-GAM									94.0		
76	26	00	RRSA-GAM									90.0		
76	26	00	MLA1-GAM									204.0		
76	26	00	MLA2-GAM									275.0		
76	01	00	MLA1-GAM									290.0		
76	01	00	MLA2-GAM									600.0		
76	01	00	RRSA-GAM									600.8		
76	02	00	MLA1-GAM									285.0		
76	02	00	MLA2-GAM									285.0		
76	03	00	RRSA-GAM									680.0		
76	03	00	MLA1-GAM									380.0		
76	03	00	MLA2-GAM									392.0		
76	03	00	RRSA-GAM									820.0		
76	04	00	MLA1-GAM									1.6		
76	04	00	MLA2-GAM									264.0		
76	04	00	RRSA-GAM									438.0		
76	04	00	MLA1-GAM									750.0		
76	04	00	MLA2-GAM									1.1		
76	04	00	RRSA-GAM									464.0		
76	04	00	MLA1-GAM									462.0		
76	04	00	MLA2-GAM									860.0		
76	04	00	RRSA-GAM									1.9		
76	04	00	A-CC	49	7.8	0.5	41	5.1	0.6	4.3	7.0	0.2		
76	07	04	A-CC									1.6	0.3	
76	08	04	A-CC	53	8.0	0.9	33	4.5	0.5	6.7	6.6	0.5		
76	08	04	MLA11-GPM									1.7	0.5	
76	08	04	MLA2-GPM									492.0		
76	08	04	A-GPM									492.0		
76	08	04	A-GPM									1.6		
76	09	04	A-CC	189	15.0	3.8	37	6.9	0.4	5.2	8.8	0.5	1020.0	
76	10	04	A-CC									21.4	0.2	
76	10	04	A-CC	45	8.2	0.5	33	5.4	0.6	5.3	7.2	0.2		
76	10	04	MLA11-GPM									2.2	0.4	
76	10	04	MLA2-GPM									540.0		
76	10	04	RRSA-GPM									530.0		
76	10	04	A-GPM									1160.0		
76	11	04	A-CC	41	5.1	0.8	29	3.2	0.5	7.5	5.0	0.4		
76	11	04	A-CC									2.3	0.3	
76	12	04	A-CC	41	7.5	0.3	33	5.4	0.7	7.8	7.1	0.0		

ANALYSES

YEAR	DAY	MON	SAMPLE DESIGNATION	UNFILTERED			TP	FILTERED					METAL ANALYSIS				
				COD	BOD	TKN		COD	BOD	FOC	NH4N	NO2N	NO3N	TKN	TP	UNFILTERED FE	FILTERED AL
76	12	04	EA-C													2.2	0.3
76	12	04	MLA11-GPM													500.0	
76	12	04	MLA21-GPM													580.0	
76	12	04	RSA-GPM													1080.0	
76	12	04	EA-C													4.0	
76	13	04	EA-C	46	9.9	0.5	33	6.5	0.7	7.9	8.3	0.2				1.7	0.2
76	14	04	EA-C	37	10.4	0.7	33	7.8	0.5	6.4	9.0	0.2				1.1	0.3
76	14	04	EA-C														
76	15	04	EA-C	42	7.7	0.3	33	5.9	0.5	6.2	7.3	0.0				1.3	0.3
76	15	04	EA-C														
76	15	04	MLA11-GPM													570.0	
76	15	04	MLA21-GPM													600.0	
76	15	04	RSA-GPM													1000.0	
76	15	04	EA-C													2.1	
76	16	04	EA-C	37	15.6	0.3	33	3.3	0.5	6.9	5.2	0.0				1.6	0.3
76	16	04	EA-C														
76	17	04	EA-C	33	5.7	0.3	37	3.3	0.4	7.9	4.6	0.0				1.6	0.3
76	17	04	EA-C														
76	18	04	EA-C	25	5.5	0.4	17	3.9	0.4	8.0	4.4	0.1				2.1	0.3
76	18	04	EA-C														
76	19	04	EA-C	37	7.2	0.0	33	5.9	0.7	7.2	6.2	0.0				2.5	0.3
76	19	04	EA-C														
76	20	04	EA-C	50	10.0	1.0	29	7.1	0.4	7.3	9.0	0.3				8.6	0.4
76	20	04	EA-C														
76	21	04	EA-C	37	11.3	0.5	33	8.2	0.4	2.6	9.8	0.3				1.5	0.3
76	21	04	EA-C														
76	22	04	MLA11-GPM													630.0	
76	22	04	MLA21-GPM													600.0	
76	22	04	RSA-GPM													1130.0	
76	22	04	EA-C	41	9.9	0.6	37	6.4	0.4	3.1	8.2	0.3				5.5	
76	22	04	EA-C														
76	22	04	MLA11-GPM													540.0	0.3
76	22	04	MLA21-GPM													560.0	
76	22	04	RSA-GPM													1070.0	
76	22	04	EA-C													2.6	
76	23	04	EA-C	50	8.4	0.7	37	2.0	0.5	4.5	6.0	0.3					
76	23	04	EA-C														
76	23	04	EA-C	71	6.8	0.0	33	4.0	0.7	12.5	5.9	0.4					
76	23	04	EA-C														
76	23	04	EA-C	37	6.6	0.6	29	5.0	0.6	15.0	5.7	0.2					
76	23	04	EA-C														
76	23	04	EA-C	41	8.8	0.3	33	8.0	0.6	15.2	8.0	0.1					
76	23	04	EA-C														
76	23	04	EA-C	41	12.2	0.3	33	11.0	0.6	13.5	11.0	0.1					
76	23	04	EA-C														
76	23	04	EA-C	41	18.0	0.3	33	16.0	0.4	9.1	11.4	0.1					
76	23	04	EA-C														
76	23	04	EA-C	41	16.0	0.5	33	13.0	0.5	9.6	17.0	0.1					
76	23	04	EA-C														
76	23	04	EA-C	37	16.0	0.3	33	13.0	0.6	7.7	13.3	0.3					
76	23	04	EA-C														
76	23	04	EA-C	41	15.0	0.6	29	15.0	0.6	7.3	16.1	0.2					
76	23	04	EA-C														
76	23	04	EA-C	41	13.5	0.5	41	16.0	0.6	10.8	16.4	0.3					
76	23	04	EA-C														
76	23	04	EA-C	46	9.0	0.7	29	9.0	0.4	8.0	9.5	0.4					
76	23	04	EA-C														
76	23	04	EA-C	46	9.0	0.8	33	8.0	0.5	10.2	8.2	0.6					
76	23	04	EA-C														
76	23	07	MLB1-GPM													93.0	
76	23	07	MLB1-GAM													312.0	
76	23	07	MLB1-GAM													400.0	
76	23	07	MLB1-GPM													76.0	
76	23	07	MLB1-GPM													1.8	
76	23	07	RSA-GPM													387.0	
76	24	07	MLB1-GPM													52.0	
76	24	07	RSA-GPM													300.0	
76	24	07	MLB1-GPM													1.9	
76	25	08	MLB1-GPM													75.0	
76	25	08	MLB1-GPM													7.5	

ANALYSES

YEAR	DAY	MON	SAMPLE DESIGNATION	UNFILTERED		TP	FILTERED							METAL ANALYSIS					
				COD	BOD		TKN	COD	BOD	FOC	NH4N	NO2N	NO3N	TKN	TP	UNFILTERED FE	FILTERED AL	FILTERED FE	AL
75	05	08	ML31-GPM														315.0		
75	07	08	ML31-GAM														87.5		
75	07	08	ML31-GAM														2.5		
75	07	08	ML31-GAM														465.0		
75	12	08	ML31-C	82	12	70.6	2.1	59			66.0	0.1	94.0	68.6	1.3				0.1
75	12	08	ML31-C			107.0											1.7		
75	12	08	ML31-GAM														45.0		
75	12	08	ML31-GPM														353.0		
75	12	08	ML31-GPM														2.0		
75	14	08	ML31-GPM														72.0		
75	14	08	ML31-GPM														303.0		
75	14	08	ML31-GPM														2.2		
75	18	08	ML31-C	118	17	76.7	2.6	67	8	26	35.0	0.8	0.2	74.9	1.5				0.7
75	18	08	ML31-C			70.0											1.7		
75	18	08	ML31-GAM														57.0		
75	18	08	ML31-GAM														279.0		
75	18	08	ML31-GAM														1.4		
75	18	08	ML31-GAM														3.4		
75	20	08	ML31-GAM														58.5		
75	20	08	ML31-GAM														36.0		
75	20	08	ML31-GAM														7.1		
75	20	08	ML31-GAM														14.7		
75	20	08	ML31-GAM														17.8		
75	20	08	ML31-GAM														3.0		
75	20	08	ML31-GAM														25.2		
75	20	08	ML31-GAM														137.0		
75	20	08	ML31-GAM														3.9		
75	20	08	ML31-GAM														58.5		
75	20	08	ML31-GAM														240.0		
75	01	09	ML31-C	107	20	19.9	1.8	56	10	19	12.9	0.3	0.0	18.1	0.2				0.8
75	01	09	ML31-GAM			55.0											3.3		
75	01	09	ML31-GAM														62.0		
75	01	09	ML31-GAM														344.0		
75	01	09	ML31-GAM														2.9		
75	03	09	ML31-C	72	12	14.6	0.5	53	6	12	10.9	0.9	7.1	13.0	0.2				0.4
75	03	09	ML31-GAM			65.0											2.2		
75	03	09	ML31-GAM														67.5		
75	03	09	ML31-GAM														303.0		
75	03	09	ML31-GAM														2.5		
75	09	09	ML31-GAM														294.0		
75	11	09	ML31-GAM														297.0		
75	15	09	ML31-GAM														296.0		
75	18	09	ML31-C	320	73	20.3	4.0	28	5	13	8.9	0.2	7.3	10.9	8.3				
75	18	09	ML31-GAM			238.0													
75	19	09	ML31-GAM			237.0											286.5		
75	22	09	ML31-GAM														328.0		
75	30	09	ML31-GAM																
75	02	10	ML31-GAM														208.0		
75	07	10	ML31-GAM														247.0		
75	09	10	ML31-GAM			420.0											295.0		
75	09	10	ML31-GAM																
75	15	10	ML31-GAM														158.0		
75	17	10	ML31-GAM														153.0		
75	17	10	ML31-GAM			185.0											72.5		
75	22	10	ML31-GAM														27.5		

ANALYSES

YEAR	DAY	MON	SAMPLE DESIGNATION	UNFILTERED				FILTERED								METAL ANALYSIS			
				COD	BOD	TKN	TP	COD	BOD	FOC	NH4N	NO2N	NO3N	TKN	TP	UNFILTERED FE	AL	FILTERED FE	AL
75	22	10	FB1-GPM														1.2		
75	22	10	RSB1-GPM														141.0		
75	24	10	MLB1-GPM														42.5		
75	24	10	FB1-GPM														1.4		
75	24	10	RSB1-GPM														164.0		
75	28	10	MLB1-GPM														26.9		
75	28	10	RSB1-GPM														111.0		
75	31	10	MLB1-GPM														13.9		
75	31	10	FB1-GPM														1.9		
75	31	10	RSB1-GPM														58.0		
75	05	11	MLB1-GPM														25.3		
75	05	11	FB1-GPM														1.1		
75	05	11	RSB1-GPM														137.9		
75	07	11	MLB1-GPM														9.9		
75	07	11	FB1-GPM														1.6		
75	07	11	RSB1-GPM														80.0		
75	11	11	MLB1-GPM														17.9		
75	11	11	FB1-GPM														1.0		
75	11	11	RSB1-GPM														213.0		
75	13	11	FB1-GPM	85	6	83.0	1.5	65	11	19	64.0	0.2	0.2	75.3	0.6				
75	13	11	FB1-GPM														1.1		0.2
75	13	11	MLB1-GAM			114.0													
75	13	11	MLB1-GPM														31.3		
75	13	11	FB1-GPM														1.5		
75	13	11	RSB1-GPM	79	13	74.3	1.7	66	7	18	60.0	0.7	1.0	72.8	1.1				
75	13	11	FB1-GPM														227.0		
75	13	11	FB1-GPM														0.5		0.2
75	13	11	MLB1-GAM			113.0													
75	13	11	MLB1-GPM														36.3		
75	13	11	RSB1-GPM														210.0		
75	13	11	FB1-GPM														1.2		
75	13	11	FB1-GPM	85	11	75.3	2.2	70	10	21	61.0	0.7	0.4	72.4	1.6				
75	13	11	FB1-GPM														0.6		0.2
75	13	11	FB1-GPM														2.7		
75	02	12	MLB1-GPM														84.1		
75	02	12	RSB1-GPM														576.0		
75	04	12	FB1-GPM														1.2		0.4
75	04	12	FB1-GAM														63.9		
75	04	12	FB1-GAM														3.4		
75	04	12	RSB1-GAM														288.0		
75	04	12	MLB1-GAM			80.0													
75	04	12	FB1-GPM	159	*48	30.8	2.6	71	24	25	18.0	0.4	1.2	25.5	0.0				
75	04	12	FB1-GPM														2.4		0.4
75	04	12	FB1-GPM	92	23	32.1	1.4	45	15	19	22.5	0.6	2.4	28.1	0.1				
75	09	12	FB1-GPM			52.0													
75	09	12	MLB1-GAM														40.5		
75	09	12	RSB1-GAM														3.4		
75	09	12	FB1-GAM														168.0		
75	09	12	FB1-GAM														1.8		0.2
75	17	12	FB1-GPM														0.4		
75	19	12	MLB1-GPM														159.0		
75	19	12	MLB1-GPM														129.0		
75	22	12	MLB1-GAM														66.0		
75	27	12	MLB1-GPM														85.2		
75	30	12	MLB1-GAM														90.4		
76	01	01	MLB1-GPM														94.8		
76	03	01	MLB1-GAM														100.0		
76	06	01	MLB1-GAM														122.0		

ANALYSES

YEAR	DAY	MON	SAMPLE DESIGNATION	UNFILTERED				FILTERED										METAL ANALYSIS	
				COD	BOD	TKN	TP	COD	BOD	FOC	NH4N	NO2N	NO3N	TKN	TP	UNFILTERED FE	FILTERED AL	FILTERED FE	FILTERED AL
76	08	01	MLB1-GAM														128.0		
76	20	01	MLB1-GPM													21.0			
76	20	01	EB1-GPM													1.0			
76	20	01	RSB1-GPM													170.0			
76	21	01	EB1-C	83	14	76.2	0.9	63	8	16	74.0	0.8	0.8	74.2	0.5	0.6		0.2	
76	21	01	EB1-C																
76	21	01	MLB1-GAM			114.0										0.6			
76	21	01	EB1-GAM													17.8			
76	21	01	MLB1-GAM													182.0			
76	21	01	RSB1-GPM													1.0		0.4	
76	23	01	EB1-C													18.0			
76	23	01	MLB1-GAM													125.0			
76	23	01	RSB1-GAM													1.0			
76	23	01	EB1-GAM													84.0			
76	08	04	MLB1-GPM													112.0			
76	10	04	MLB1-GPM													88.0			
76	12	04	MLB1-GPM													75.0			
76	15	04	MLB1-GPM													52.0			
76	21	04	MLB1-GPM													60.0			
76	22	04	MLB1-GPM													75.0			
76	11	07	MLB1-GPM													0.6			
76	11	07	EB1-C													292.0			
76	10	07	MLB2-GAM													2.2			
76	10	07	EB1-GAM													608.0			
76	11	07	RSB1-GAM													344.0			
76	17	07	EB1-GAM													1.8			
76	17	07	RSB1-GAM													928.0			
76	17	07	EB1-C	74	6	11.8	1.3	46	3	11	8.4	1.1	49.9	10.2					
76	22	07	MLB1-GAM			271.0													
76	22	07	MLB2-GAM			268.0													
76	22	07	MLB1-GAM													405.0			
76	22	07	EB1-C													2.1		0.3	
76	22	07	EB1-GAM													432.0			
76	22	07	MLB2-GAM													900.0			
76	22	07	RSB1-GAM																
76	24	07	EB1-C	71	6	13.6	1.8	41	4	13	9.7	0.1	35.9	12.3	0.4	4.1		0.3	
76	24	07	EB1-C			258.													
76	24	07	MLB1-GAM													417.0			
76	24	07	MLB1-GAM													411.0			
76	24	07	MLB1-GPM													5.0			
76	24	07	EB1-GPM													4.9			
76	24	07	EB1-GAM													378.0			
76	24	07	MLB2-GAM													342.0			
76	24	07	MLB2-GPM			284.										900.0			
76	24	07	RSB1-GPM													828.0			
76	24	07	RSB1-GAM													300.0			
76	29	07	MLB2-GPM													2.1			
76	29	07	EB2-GPM													19.0			
76	29	07	RSB2-GPM													65.0			
76	31	07	MLB2-GPM													203.0			
76	31	07	RSB2-GPM													2.4			
76	31	07	EB2-GPM													200.0			
76	05	08	RSB2-GPM													85.0			
76	05	08	MLB2-GPM													2.6			
76	05	08	EB2-GPM													2.2			
76	07	08	EB2-GAM													103.0			
76	07	08	MLB2-GAM													225.0			
76	07	08	RSB2-GAM																

ANALYSES

YEAR DAY MON			SAMPLE DESIGNATION	UNFILTERED			TP	FILTERED							METAL ANALYSIS				
YEAR	DAY	MON		COD	BOD	TKN	TP	COD	BOD	FOC	NH4N	NO2N	NO3N	TKN	TP	UNFILTERED FE	FILTERED AL	FILTERED FE	FILTERED AL
75	12	08	EB2-C	71	9	11.4	2.5	51	6	16	9.6	9.1	35.9	9.9	1.2				
75	12	08	EB2-C													3.6		0.25	
75	12	08	MLB2-GAM			94.0													
75	12	08	MLB2-GPH													75.0			
75	12	08	RSB2-GPH													1.9			
75	12	08	RSB2-GPH													140.0			
75	14	08	EB2-GPH													1.5			
75	14	08	MLB2-GPH													90.0			
75	14	08	RSB2-GPH													204.0			
75	18	08	EB2-C	80	11	16.3	2.5	62	7	19	11.4	7.0	51.0	14.8	1.6				
75	18	08	EB2-C													2.0		0.9	
75	18	08	MLB2-GAM			94.2										64.0			
75	18	08	MLB2-GPH													2.1			
75	18	08	RSB2-GPH													100.0			
75	18	08	RSB2-GPH													3.9			
75	18	08	RSB2-GPH													68.0			
75	18	08	RSB2-GPH													144.0			
75	18	08	RSB2-GPH													5.5			
75	18	08	RSB2-GPH													60.0			
75	18	08	RSB2-GPH													108.0			
75	18	08	RSB2-GPH													2.6			
75	18	08	RSB2-GPH													72.0			
75	18	08	RSB2-GPH													107.0			
75	18	08	RSB2-GPH													1.6			
75	18	08	RSB2-GPH													136.0			
75	18	08	RSB2-GPH													324.0			
75	01	08	EB2-C	71	9	8.7	1.2	43	4	13	6.2	0.9	7.9	7.8	0.4				
75	01	08	EB2-C			165.0										2.2		0.2	
75	01	08	MLB2-GAM													2.5			
75	01	08	MLB2-GAM													178.0			
75	01	08	MLB2-GAM													276.0			
75	01	08	MLB2-GAM																
75	03	08	EB2-C	129	42	21.2	1.9	73	23	27	18.0	0.2	1.7	18.9	0.0				
75	03	08	EB2-C													2.5		0.8	
75	03	08	MLB2-GPH													4.1			
75	03	08	MLB2-GAM			219.0										219.0			
75	03	08	MLB2-GPH													453.0			
75	03	08	RSB2-GPH													8.5			
75	03	08	RSB2-GPH													290.0			
75	03	08	RSB2-GPH													489.0			
75	03	08	RSB2-GPH													3.8			
75	11	08	MLB2-GPH													318.0			
75	11	08	RSB2-GPH													553.0			
75	16	08	RSB2-GPH													2.2			
75	16	08	MLB2-GPH													308.0			
75	16	08	RSB2-GPH													496.0			
75	18	08	EB2-C	320	73	20.3	4.0	28	5	13	8.9	0.2	7.3	10.9	0.3			0.7	
75	18	08	RSB2-GPH													510.0			
75	18	08	MLB2-GPH													252.5			
75	18	08	MLB2-GAM													2.2			
75	22	08	EB2-C	492	46	25.0	6.0	39	5	14	13.0	0.3	8.3	16.0	0.1				
75	22	08	EB2-C			25.0										24.5		0.5	
75	22	08	EB2-GPH													2.2			
75	22	08	MLB2-GPH													336.0			
75	22	08	MLB2-GAM			148.0													
75	22	08	RSB2-GPH													446.0			

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ANALYSES

YEAR	DAY	MON	SAMPLE DESIGNATION	UNFILTERED				FILTERED								METAL ANALYSIS			
				COD	BOD	TKN	TP	COD	BOD	FOC	NH4N	NO2N	NO3N	TKN	TP	UNFILTERED FE	FILTERED AL	FILTERED FE	AL
76	08	01	1-GAM														3.0		
76	08	01	11-HR														2.2		0.3
76	08	01	2-GAM														180.0		
76	08	01	3-GAM														2.6		0.4
76	21	01	1-C	68	14	28.3	1.1	127	4	12	27.0	13.9	52.1	27.3	0.3				
76	21	01	2-C														0.9		0.1
76	20	01	1-GPM														52.5		
76	20	01	2-GPM														0.5		
76	20	01	3-GPM														120.0		
76	21	01	1-GAM														0.9		
76	21	01	2-GAM														54.0		
76	21	01	3-GAM														140.0		
76	23	01	1-C			98.0											1.4		0.3
76	23	01	2-GAM														26.0		
76	23	01	3-GAM														57.5		
76	23	01	4-GAM														1.2		
76	10	02	1-C	68		5.2		56			0.7	0.4	19.0	1.8					
76	11	02	1-C	76		1.6		80			0.4	0.1	15.7	1.2					
76	11	02	2-C	72		2.1		48			0.6	0.3	16.4	1.1					
76	11	02	3-C	88		2.7		32			0.4	0.1	14.5	1.2					
76	11	02	4-C	76		1.9		32			0.4	0.2	16.8	1.8					
76	11	02	5-C	80		2.5		28			0.4	0.1	17.4	1.8	-				
76	11	02	6-C	72		3.5		36			0.6	1.7	13.5	0.8					
76	11	02	7-C	92		2.6		32			0.4	0.6	14.1	1.4					
76	11	02	8-C	93		3.3		33			0.2	0.1	12.7	1.3					
76	11	02	9-C	93		2.4		28			0.3	0.8	13.3	2.2					
76	11	02	10-C	77		2.2		24			0.2	1.2	14.0	0.6					
76	11	02	11-C	61		1.4		24			0.1	0.4	13.4	0.6					
76	11	02	12-C	90		2.9		29			0.1	0.2	11.7	1.0					
76	11	02	13-C	91		2.7		29			0.6	1.6	10.7	0.7					
76	11	02	14-C	90		3.7		37			0.7	1.6	14.3	2.0					
76	11	02	15-C	86		2.8		86			0.5	2.2	11.2	2.5					
76	11	02	16-C	82		7.9	1.9	41			3.7	0.5	7.8	6.4	1.4				
76	07	03	1-C	74		8.2	1.6	41			3.6	0.3	7.5	6.1	1.2	1.0		0.1	
76	07	03	2-C														1.3		1.1
76	07	03	3-C														80.0		
76	07	03	4-C														136.0		
76	07	03	5-C														1.3		
76	07	03	6-C	78		10.0	1.9	37			6.1	0.3	8.4	7.1	1.2	1.2		0.2	
76	07	03	7-C	86		8.0	1.7	37			4.3	0.4	8.0	5.6	0.9				
76	10	04	1-C														1.6		0.3
76	10	04	2-C														88.0		
76	10	04	3-C														190.0		
76	10	04	4-C														1.4		
76	11	04	1-C	58		4.1	1.6	29			2.2	0.2	9.3	3.8	1.0				
76	11	04	2-C	58		9.5	1.8	33			4.6	0.4	8.5	5.8	1.5	1.6		0.6	
76	11	04	3-C														0.7		0.7
76	11	04	4-C														56.0		
76	11	04	5-C														120.0		
76	11	04	6-C														1.2		
76	11	04	7-C	54		7.4	2.0	42			5.7	0.4	9.1	6.8	1.7				
76	11	04	8-C														0.6		0.2
76	11	04	9-C	54		10.1	1.9	37			7.3	0.3	7.0	8.8	1.4				
76	11	04	10-C														0.5		0.3
76	11	04	11-C	46		7.8	1.7	42			5.6	0.3	6.4	6.0	1.4				
76	11	04	12-C														0.5		0.5

ANALYSES

YEAR	DAY	MON	SAMPLE DESIGNATION	UNFILTERED			TP	FILTERED				TP	METAL ANALYSIS						
				COD	BOD	TKN		COD	BOD	FOC	NH4N		NO2N	NO3N	TKN	UNFILTERED FE	FILTERED AL	FILTERED FE	FILTERED AL
76	15	04	ML-32-GPM													75.0			
76	15	04	SS-32-GPM													150.0			
76	15	04	ML-32-GPM													1.3			
76	16	04	SS-32-GPM	37		4.9	1.6	33			3.0	0.2	8.0	4.4	1.3				
76	16	04	ML-32-GPM													0.6		0.1	
76	17	04	SS-32-GPM	46		4.8	1.7	21			2.7	2.2	7.5	4.0	1.3			11.6	
76	17	04	ML-32-GPM													0.6			
76	18	04	SS-32-GPM	29		5.8	1.9	25			3.9	0.2	7.8	4.9	1.7			0.1	
76	18	04	ML-32-GPM													0.5			
76	19	04	SS-32-GPM	46		7.4	1.2	41			6.2	0.5	6.4	7.3	1.0			0.3	
76	19	04	ML-32-GPM													0.6			
76	20	04	SS-32-GPM	81		11.6	2.8	37			7.1	0.2	7.3	8.7	2.1			0.4	
76	20	04	ML-32-GPM													1.3			
76	21	04	SS-32-GPM	46		12.6	2.0	37			8.9	0.3	2.1	11.5	2.0			0.2	
76	21	04	ML-32-GPM													0.3			
76	21	04	SS-32-GPM													40.0			
76	21	04	ML-32-GPM													80.0			
76	21	04	SS-32-GPM													1.6			
76	22	04	ML-32-GPM	54		11.2	1.9	46			7.6	0.2	2.1	9.8	1.8				
76	22	04	SS-32-GPM													0.3		0.1	
76	22	04	ML-32-GPM													64.0			
76	22	04	SS-32-GPM													110.0			
76	22	04	ML-32-GPM													1.7			
76	21	04	SS-32-GPM	75		10.0	3.2	29			9.0	0.3	10.9	9.3	2.6				
76	21	04	ML-32-GPM	54		9.4	3.6	33			8.0	0.4	13.3	8.4					
76	21	04	SS-32-GPM	54		8.6	3.1	29			8.0	0.1	8.8	6.7	2.6				
76	21	04	ML-32-GPM	37		9.9	2.8	33			8.2	0.2	9.9	8.4	2.7				
76	21	04	SS-32-GPM	79		11.8	2.5	33			11.0	0.2	9.8	10.8	1.9				
76	21	04	ML-32-GPM	37		12.6	1.9	33			11.0	0.3	11.5	16.1	1.7				
76	21	04	SS-32-GPM	46		13.8	1.8	33			11.0	0.4	7.6	11.4	1.4				
76	21	04	ML-32-GPM	54		16.3	1.8	41			11.0	0.4	4.4	12.2	1.6				
76	21	04	SS-32-GPM	54		16.3	1.9	29			11.0	0.5	5.5	14.2	1.8				
76	22	04	ML-32-GPM	66		16.0	2.0	33			11.0	0.4	5.7	14.3	1.9				
76	22	04	SS-32-GPM	58		13.3	1.9	37			11.0	0.3	5.5	12.4	1.6				
76	22	04	ML-32-GPM	70		12.9	2.0	46			11.0	0.2	5.1	10.3	1.5				
76	10	02	SS-32-GPM	48		4.6		40			0.5	0.8	4.2	1.1					
76	11	02	ML-32-GPM	52		1.1		52			0.7	0.2	1.3	1.0					
76	12	02	SS-32-GPM	44		1.6		44			0.2	0.2	1.8	1.5					
76	13	02	ML-32-GPM	48		1.3		60			0.2	0.0	1.8	0.2					
76	14	02	SS-32-GPM	32		0.5		24			0.2	0.0	1.8	0.4					
76	15	02	ML-32-GPM	32		1.9		24			0.7	0.0	6.2	1.9					
76	16	02	SS-32-GPM	46		1.5		28			0.4	0.1	1.4	0.9					
76	17	02	ML-32-GPM	36		1.2		24			0.3	0.0	1.4	1.2					
76	18	02	SS-32-GPM	41		1.3		24			0.2	0.0	1.4	1.0					
76	19	02	ML-32-GPM	33		0.6		24			0.2	0.0	1.4	0.4					
76	20	02	SS-32-GPM	41		1.5		38			0.1	0.0	1.6	0.6					
76	21	02	ML-32-GPM	20		0.8		33			0.2	0.0	1.5	0.6					
76	22	02	SS-32-GPM	41		1.2		37			0.1	0.0	1.4	1.1					
76	23	02	ML-32-GPM	41		1.0		29			0.3	0.0	1.3	0.9					
76	24	02	SS-32-GPM	33		2.6		33			0.3	0.0	1.5	1.3					
76	24	02	ML-32-GPM	37		0.3		33			0.1	0.0	1.6	0.3					
76	25	02	SS-32-GPM	29		0.8		43			0.2	0.0	1.4	0.7					

STOP

APPENDIX C

Abbreviations and Symbols

APPENDIX C

Abbreviations and Symbols

Abbreviations and symbols appearing in this report, not commonly used or not defined with the report, are listed on the following pages.

They are arranged according to where they appear in the report.

Abbreviations and symbols appearing in "Data Listing"

Appendix B:

MON	- month.
OPERATING MODE	- reactor system under operation; 1 - TSC* (TSC without chemical addition) 2 - TSC (with chemical addition) 3 - TSS (with chemical addition).
TSS	- two-stage separate sludge system.
TSC	- two-stage combined sludge system.
TSC*	- two-stage combined sludge system without chemical addition.
FSC	- five-stage combined sludge system (extended aeration Plant D).
SSRT	- system solids retention time (days).
TEMP	- temperature (°C).
SS	- suspended solids (mg/l).
ALK	- alkalinity as CaCO ₃ (mg/l).
CHEM	- chemical being added.
RATE	- rate of ion addition (mg/l).
APPROX	- approximately.
MLSS	- mixed liquor suspended solids (mg/l).
VSS	- mixed liquor volatile suspended solids (mg/l).
WASTE CONC	- concentration of solids wasted (mg/l).
IGAL WASTE	- imperial gallons of solids wasted.
DO	- dissolved oxygen (mg/l).
OUR	- mixed liquor oxygen uptake rate (mg O ₂ /g-hr).

REACTOR	- aeration tank of reactor system referred to; A1 - first stage of TSC system. A2 - second stage of TSC system. B1 - first stage of TSS system or FSC system. B2 - second stage of TSS system. D3 - third baffled section of extended aeration plant.
RF	- raw sewage.
-0900	- time sample taken.
-GAM	- grab sample taken in AM.
-GPM	- grab sample taken in PM.
-C	- composite of 24-hr by hr samples.
EA	- clarified effluent sample from Plant A.
EB1	- clarified effluent sample from first stage of TSS system Plant B.
EB2	- clarified effluent sample from second stage of TSS system Plant B.
EB	- clarified effluent sample from Plant B.
ED	- clarified effluent sample from Plant D.
MLA1	- mixed liquor sample from aeration tank A1 Plant A.
MLA2	- mixed liquor sample from aeration tank A2 Plant A.
MLB1	- mixed liquor sample from aeration tank B1 Plant B.
MLB2	- mixed liquor sample from aeration tank B2 Plant B.
RSA	- return sludge to two-stage combined system Plant A.
RSB	- return sludge to two-stage combined system Plant B.
RSB1	- return sludge from first stage clarifier to first stage of TSS system Plant B.
RSB2	- return sludge from second stage clarifier to second stage of TSS system of Plant B.

COD	- chemical oxygen demand (mg/l).
BOD	- five-day, 20°C biochemical oxygen demand (mg/l).
TKN	- total Kjeldahl nitrogen (mg/l).
TP	- total phosphorus (mg/l).
FOC	- filtered organic carbon (mg/l).
NH ₄ N	- ammonia plus ammonium-nitrogen (mg/l).
NO ₃ N	- nitrate-nitrogen (mg/l).
NO ₂ N	- nitrite-nitrogen (mg/l).

Other abbreviations and symbols appearing throughout the report:

SRT	- solids retention time (days).
SSRT	- system solids retention time (days).
PSS-1	- pseudo "steady-state" run number 1.
V-1	- variability experiment number 1.
>	- greater than.



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